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VETERINARY MEDICINE

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Antibiotics for Digestive Disturbances in Young Pigs

Serum Levels of Aureomycin in Foals

Cell Types Present in Milk of Cows in a Chronic Staphylococcal Mastitis Herd

The Toxic and Analgesic Effects of Procaine Hydrochloride Administered Intravenously

Hyaluronidase in Hypodermocylsis

Etiology of Yellow Fat Disease in Mink

Experimental Immunization of Chickens with Combined Whole Embryo Newcastle and Fowl Pox Vaccines

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Antibiotics For Digestive Disturbances In Young Pigs*

C. K. WHITEHAIR,** D.V.M., Ph.D., A. A. HEIDEBRECHT,** B.S., M.S., and O. B. ROSS,** Ph.D., Stillwater, Oklahoma

THE use of antibiotics in swine rations has received considerable emphasis during the past year. In September 1949, Cunha, *et al.*,[1] demonstrated that the Lederle APF supplement contained some growth factor or factors other than vitamin B_{12} that gave remarkable growth stimulation in young pigs. In Cunha's work, when the Lederle APF supplement was added to a corn-peanut meal ration containing minerals and all the vitamins known to be required by the pig, it improved the growth rate approximately 2.5 times. In April 1950, Jukes, *et al.*,[2] published data indicating that crystalline aureomycin was an important constituent of the Lederle APF supplement for swine.

This was followed by an enormous amount of work at various experiment stations concerning evaluation of APF supplements and antibiotics in swine rations which eventually culminated in the presentation of over 15 papers on this subject at the November 1950, meeting of the American Society of Animal Production. In these papers, it is evident that many of the antibiotics, or APF supplements containing antibiotics, give a remarkable growth performance in pigs. The most marked growth stimulation has been noted in unthrifty pigs. In these cases, growth has been improved as much as 100%. Even in pigs that are apparently healthy and fed well-balanced rations some improvement has been noted—more in the order of 5 to 10%. Thus, what was thought in 1948 to be mainly a vitamin or vitamin-like substance in the APF complex now assumes the character of an antibiotic.

The sulfonamide drugs, especially sulfaguanidine and sulfathalidine, have been known to be beneficial in the treatment of digestive disturbances in swine for some time. Graham, *et al.*,[3] found that 88.8% of 707 pigs affected with clinical enteritis in natural field outbreaks responded favorably to sulfathalidine therapy. This was in contrast to only 42% of the controls recovering satisfactorily. Edmonds[4] has also reported the value of sulfathalidine in the treatment of enteritis in pigs. Kernkamp and Roepke[5] found that sulfaguanidine was of considerable value in the treatment of the infectious enteritis complex in swine.

This paper reports data of an experiment conducted to determine the growth and survival rate of unthrifty pigs fed various antibiotics, combinations of antibiotics and vitamin B_{12}, and sulfathalidine.

Experimental

Forty-eight unthrifty pigs from the 1950 spring pig crop, weighing from 15.5 to 50 lb., were used in this experiment. They had a persistent type of diarrhea and rough hair coat; all exhibited extreme lack of vigor. They were divided into eight lots with respect to weight, age, and physical condition. All pigs were treated with benzene hexachloride for control of lice and mange. The pigs were fed in drylot on concrete floors which were washed daily. The rations fed are presented in table 1. All pigs were self-fed and had access to automatic waterers.

Results

The results of adding the various supplements to the basal ration are given in table 2. Death losses were extremely high in pigs fed the basal ration (lot 1) and fermented basal ration (lot 8). Mortality was reduced in lots fed the basal ration supplemented with aureomycin (lot 2), streptomycin (lot 3), penicillin (lot 4), penicillin plus vitamin B_{12} (lot 5), Lederle APF containing aureomycin and vitamin B_{12} (lot 6), and sulfathalidine (lot 7). Pigs that regularly consumed feed containing the various supplements overcame the enteritis and responded with a marked increase in rate of gain and vigor. The hair coat and general appearance of the pigs also improved. *Pigs that*

*This study supported in part by a grant from Merck & Co., Inc. Rahway, N. J. Acknowledgment is made to Merck & Co., Inc. for the supplies of penicillin, streptomycin, and vitamin B_{12}; to Dr. S. H. Scheidy, Sharp & Dohme, Inc., Glenolden, Pa., for the sulfathalidine; and to Lederle Laboratories, Pearl River, N. Y., for the crystalline aureomycin and APF supplement.

**Department of Animal Husbandry, Oklahoma Agricultural Experiment Station, Stillwater.

failed to eat continued to have a chronic diarrhea, became weak and emaciated, and finally died. Most of the deaths in the lots fed antibiotics occurred very early in the experimental period, in many cases within a few days after feeding was begun. It was thought that many of these deaths occurred before the antibiotics afforded any protection. Pigs fed the basal ration and fermented basal ration had a chronic diarrhea throughout the experiment.

TABLE 1. EXPERIMENTAL RATIONS FED

Basal Ration	%
Ground yellow corn	69.5
Expeller soybean meal	7.0
Tankage (60% protein)	10.0
Fish meal	2.0
Cottonseed meal	5.0
Alfalfa leaf meal	5.0
Trace mineralized salt (Barton's)	0.5
Steamed bone meal	1.0
	100.0

Lot No.	Supplements added to each lot
1	Basal (control)
2	Basal + 2.5 gm. aureomycin per 100 lb. of feed
3	Basal + 2.5 gm. streptomycin per 100 lb. of feed
4	Basal + 1.25 gm. procaine penicillin G per 100 lb. of feed
5	Basal + 0.75 gm. procaine penicillin G + 0.625 mg. of vitamin B_{12} per 100 lb. of feed
6	Basal + 1.4% Lederle's APF no. 5 containing vitamin B_{12} and aureomycin
7	Basal + 0.2% sulfathalidine
8	Basal (fermented in wooden barrel at atmospheric temperature for 36 hr.)

Discussion

The data obtained in this experiment are in general agreement with those reported recently by other workers. Some workers have emphasized that the response obtained from the use of antibiotics in swine rations may vary in accordance with the type of ration fed. What may be of more importance than the type of ration fed is the type of infection encountered in these herds and the virulence of it.

In another experiment at this station[6] pigs were used from a herd that apparently was healthy, having weanling weights consistently from 35 to 40 lb. and having no problem of enteric disturbances. Pigs from this herd which were fed the APF supplement (containing vitamin B_{12} and aureomycin) gained 1.72 lb. daily, while the unsupplemented lots gained 1.54 lb. daily.

The type of digestive disturbance of the pigs used in this experiment appeared similar in many respects to that encountered by Whitehair, *et al.*,[7] at the Wisconsin station. The workers in Wisconsin believed that an infectious agent other than a microorganism was the primary causative agent.

No specific microorganism has been isolated in the disorder encountered at the Oklahoma station. In this herd, at Oklahoma, acute "flare-ups" have been encountered of what ap-

Fig. 1. This group of pigs all had a chronic type of diarrhea. They are typical of experimental pigs in lots 1 and 7. Note the humped back, gauntness, droopy ears, and dry, rough haircoat. Their appetite was poor.

pears to be an entity distinct from the digestive disturbance afflicting the pigs used in this experiment. This type of digestive disorder usually appears in older pigs and is similar to swine dysentery as described by Doyle[8]. The use of streptomycin has been very beneficial in controlling this disturbance. It is administered orally in doses of 1 to 1.5 gm. per pig. The streptomycin is mixed with a small amount of water and given by dose syringe. Treatment with streptomycin mixed in the feed is not reliable because the appetite is markedly affected by the disturbance. In the experiments reported in this paper the mortality in the lots fed the antibiotics and sulfathalidine might be attributed partially to the failure of these pigs to consume sufficient feed to obtain a therapeutic amount of the antibiotic or sulfathalidine.

TABLE 2. GROWTH AND SURVIVAL OF PIGS FED EXPERIMENTAL RATIONS

Lot No.	Ration	No. pigs per lot	Mortality	Av. daily gain of pigs completing exp. (56 da.)
1	Basal	6	5	0.54
2	Basal + aureomycin	6	3	0.87
3	Basal + streptomycin	6	1	1.25
4	Basal + penicillin	6	2	1.37
5	Basal + penicillin + vit. B_{12}	6	3	1.06
6	Basal + Lederle APF no. 5	6	1	1.23
7	Basal + sulfathalidine	6	3	0.91
8	Basal (fermented)	6	5	0.68

Summary

In this experiment the antibiotics, especially aureomycin, streptomycin, penicillin, and sulfathalidine, had a very beneficial effect in the treatment of digestive disturbances in young pigs. In the mild type of disturbance, which assumes a chronic-endemic course in a herd, these drugs may be given in the feed; but in acute outbreaks, because of the reduced feed consumption due to lack of appetite, oral administration to each individual animal is probably the best method of treatment.

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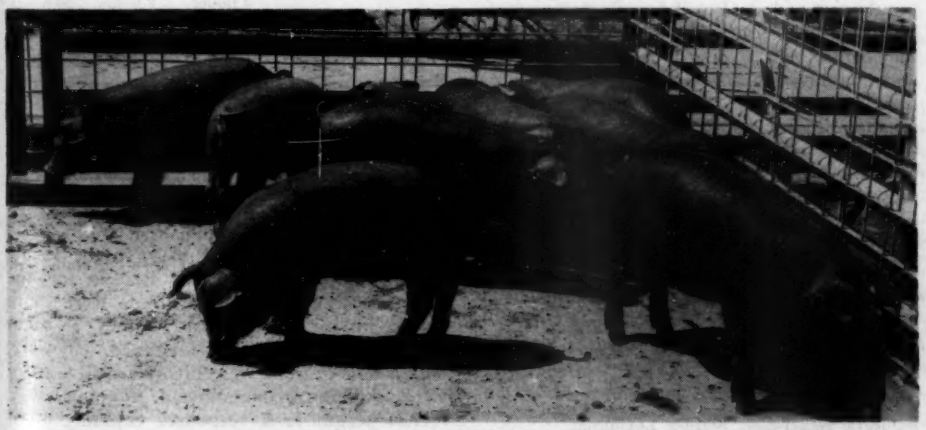


Fig. 2. Group of pigs typical of those fed antibiotic drugs. These pigs were the same age as the pigs shown in fig. 1. Note the healthy haircoat and skin.

Serum Levels Of Aureomycin In Foals*

WILLIAM H. McCOLLUM,** B. S., M.S., and E. R. DOLL,** B.S., M.A., D.V.M.,
Lexington, Kentucky

THE successful use of aureomycin† in treatment of infections occurring in man suggests the probability that this antibiotic may prove useful in treating infectious diseases of young foals. Postmortem records maintained in the Department of Animal Pathology show that the infectious organism causing the greatest mortality in young foals is *Shigella equuli*. During a period from 1921-43, infection by *Shig. equuli* caused the death of 33.5% of the foals examined; streptococcic infection was responsible for 25.4% of the deaths. Approximately 5% of the deaths were due to *Escherichia coli* infections. Relatively few foals had fatal infection with *Corynebacterium equi* and *Salmonella typhimurium*. This study was undertaken to obtain information on the serum level response of foals following intravenous administration of aureomycin, and to determine the *in vitro* sensitivity of pathogenic organisms frequently isolated from infections in horses.

Materials and Methods

The foals used in this study were apparently healthy and were of Thoroughbred and American Saddle breeding. The weights of the foals varied from 240 to 420 pounds. They were quartered in box stalls with their dams, having free access to hay and water throughout the test periods. For the single dosage trials, blood samples for assay were obtained from the jugular vein at one hour following dosing and at four-hour intervals thereafter. For the maintenance dosage trials, blood samples were obtained at one and 12 hours after injection. The blood samples were placed in a water bath at 37 C. for one hour and the serum was removed and frozen at —20 C. until the dilutions for the assay were made.

The assay procedure was modified from that of Dornbush,[1] using twofold 0.5 cc. serial dilutions of serum in penicillin assay broth† and 0.5 cc. of inoculum consisting of 1:100 dilution of a 24-hour broth culture of the test organism, *Bacillus cereus* No. 5. The greatest dilution causing complete inhibition of growth was considered the end point of the test. The aureomycin standard was prepared by appropriately diluting the contents of commercial bottles of the antibiotic. The lowest quantity of aureomycin detected by the assay procedure was 0.02 microgram per ml. of serum. The *in vitro* sensitivity tests were made similarly with twofold serial 0.5 ml. dilutions of aureomycin in broth using 0.5 cc. of a 1:100 dilution of a 24-hour broth culture as the inoculum. The *in vitro* sensitivity tests on the streptococci were made in horse-meat infusion broth. All other cultures were tested in penicillin assay broth.

Results

The results of the *in vitro* inhibition determinations are summarized in table 1. The amount of aureomycin causing complete inhibition of growth with four hours' incubation was quite variable. The variation appeared to be caused by failure of some cultures to make visible growth during this period. Except for the streptococci, the inhibition points were more consistent for the several cultures at eight hours. Of the five species examined, only *Shig. equuli* and *C. equi* were highly sensitive to *in vitro* inhibition by aureomycin.

TABLE 1. THE IN VITRO INHIBITION BY AUREOMYCIN OF BACTERIA ISOLATED FROM EQUINE INFECTIONS

	No. of Cultures	Micrograms of aureomycin causing complete inhibition of growth		
		Incubation time		
		4 hours	8 hours	24 hours
Streptococci*	15	< 0.012-12.5	0.39-25	> 25
Streptococcus equi	1	6.25	> 25	> 25
Pseudomonas aeruginosa	10	6.25->25	6.25->25	> 25
Shigella equuli	6	< 0.012	0.012-0.098	0.195-0.39
Corynebacterium equi	1	< 0.012	0.098	0.39

*Lancefield group C, Ogura type A.

The serum level responses resulting from single intravenous doses of 5 and 10 mg. of aureomycin per lb. of body weight are sum-

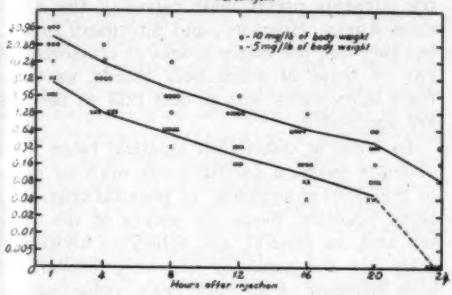
*The investigation reported in this paper is in connection with a project of the Kentucky Agricultural Experiment Station and is published by permission of the director.

**Department of Animal Pathology, Kentucky Agricultural Experiment Station, Lexington.

†The aureomycin used in this study was supplied by Lederle Laboratories Division, American Cyanamid Company, Pearl River, N. Y.

marized in figure 1. The average serum concentrations had a parallel relation until the 20th hour after injection, with the quantity of aureomycin in the serum being approximately sixfold greater with 10 mg. per lb. of body weight. With 10 mg. per lb., the serum concentrations were above 1 microgram per ml. of serum in each of the six foals at 12 hours. At 16 hours only one foal had a serum concentration above this level, and at 24 hours the serum level had fallen below detectable amounts in four foals. With single doses of 5 mg. per lb. of body weight, the serum level was below 1 microgram per ml. for each of the six foals at eight hours after injection. At 18 hours the serum level was below a detectable amount in one foal, and at 24 hours no detectable amount was present in serum from any of the foals.

Figure 1. Serum Levels of Foals Following Single Intravenous Injection of Aureomycin

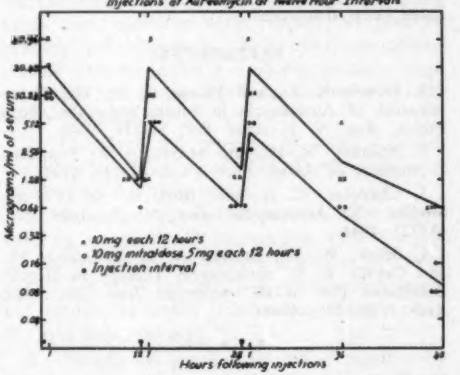


The serum level responses obtained from repetitive dosage at 12 hour intervals are summarized in figure 2. An initial dosage of 10 mg. per lb. of body weight followed by doses of 10 mg. per lb. at 12 hour intervals maintained average serum levels of aureomycin above 1 microgram per ml. of serum. The serum concentrations of individual foals at 12 hours after intravenous administration did not fall below 1.28 micrograms per ml. of serum. With the dosage of 10 mg. per lb. there was an increase in the average serum concentrations for each succeeding 12 post-injection determination. It appeared that this dose provided sufficient excess over the quantity being eliminated to produce an accumulative effect. However, this effect was not apparent in the serums obtained at one hour after the succeeding injections. Initial dosage of 10 mg. per lb. followed by 5 mg. per lb. at 12-hour intervals resulted in lower, but roughly parallel serum levels. All of the individual serum levels fell below 1 microgram per ml. at 12 hours following the succeeding 5 mg. per lb. doses. Also this dosage was inadequate for bringing succeeding 12-hour-period blood levels back to the preceding period's level.

Discussion

The low concentrations required for *in vitro* inhibition of cultures of *Shig. equuli* and *C. equi* suggest that aureomycin should be effective in treating infections caused by these two organisms. An average serum level greater than the amount of aureomycin required for *in vitro* inhibition was present for 20 hours following a single intravenous injection of 10 mg. per lb. of body weight. With 5 mg. per lb. a comparable average serum level was present for eight hours. For the more sensitive strains of *Shig. equuli*, serum levels equal to the *in vitro* sensitivity were present for 16 to 20 hours with doses of 5 mg. per lb. and for 20 to 24 hours with doses of 10 mg. per lb. With serial dosage at 12-hour intervals, doses of either 5 or 10 mg. per lb. of body weight maintained serum concentrations considerably in excess of the quantity required for *in vitro* inhibition. For the streptococci and *Pseudomonas aeruginosa* cultures, the majority of the inhibition points were considerably higher than the serum levels obtained with the 5 mg. per lb. doses. With the 10 mg. per lb. doses, serum levels comparable to the *in vitro* inhibition points were obtained only during the first four hours after injection.

Figure 2. Serum Level Responses of Foals Resulting from Intravenous Injections of Aureomycin at Twelve Hour Intervals


Micrograms/ml of serum
• 10 mg each 12 hours
• 10 mg initial dose 5 mg each 12 hours
• Injection interval
Hours following injections

In relation to organism sensitivity, infection caused by *Shig. equuli* might be expected to yield readily to treatment with aureomycin. A number of sick foals diagnosed clinically as typical of *Shig. equuli* infection have responded satisfactorily with aureomycin treatment. Details of the treatment will be presented in another report. Although the *C. equi* culture

proved to be very sensitive to the action of aureomycin, the proclivity for massive abscess formation in this infection may prevent satisfactory response. The relatively high *in vitro* resistance of the streptococci does not preclude the possibility that aureomycin therapy may produce satisfactory results upon clinical use of the antibiotic. Variance in the apparent *in vitro* activity as compared to *in vivo* activity may result from rapid deterioration of the antibiotic in culture media[3]. Also, organisms showing relatively strong *in vitro* resistance may be controlled satisfactorily in clinical treatment[4]. At present, we have no clinical evidence to indicate that streptococcic infections will yield to aureomycin therapy. With the doses used there was no evidence of toxic reactions in the foals.

Summary

The *in vitro* inhibition by aureomycin of pathogenic organisms from equine infections was determined, and the serum level responses resulting from single and multiple intravenous administration of aureomycin in foals were established. Possible uses of the antibiotic for treatment of infectious diseases of young foals have been discussed.

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▼ ▼ ▼

U. S. Bureau of Dairy Industry Wants to Buy Twin Holstein Heifer Calves

Dairy scientists in the USDA are looking for purebred or high grade identical twin Holstein heifer calves and are willing to pay a reasonable price for them. Identical twin calves, preferably under a month of age, are needed for dairy nutrition studies at the Agricultural Research Center at Beltsville, Md.

The research workers hope to obtain the necessary calves as close to Beltsville as possible, in order to permit them to make a personal examination before the purchase and to save shipping expense.

Holstein breeders in New York, Pennsylvania, Maryland, Delaware, New Jersey, Virginia, Ohio, and West Virginia who believe they have identical twin Holstein heifer calves are requested to write to E. C. Leffel, Bureau of Dairy Industry, Beltsville, Md.

The University of Maryland, College Park, Md., is looking for identical twin heifers of the other dairy breeds. The BAI at Beltsville is looking for pairs of identical twin bull or steer beef calves for use in experiments now under way with beef cattle. The animal industry scientists prefer male calves of the Aberdeen Angus, Hereford, and Shorthorn breeds, but they can use either grades or crossbreds of any of these or other beef breeds, or twins from dairy cows with a beef bull as the sire are acceptable.

In order to distinguish identical twins from ordinary twins, a careful study must be made of the pair for similarity of physical characteristics. Identical twins are always of the same sex and, in general, the following characteristics are the same or are very similar for both members of the pair: color, color pattern, general body conformation, height at withers, set of legs, rump and head, size, shape, and color of eyes, diameter and length of tail and brush, hair pattern and number, location and direction of hair whorls, and birth weight and rate of growth.

Identical twin calves are especially desirable for the Beltsville research because they have the same inherited characteristics, and when they are maintained in the same environment their rate of growth, body size, and milk production will be very similar. It is safe to assume that any differences in response will be due to differences in environment and not to inherited differences.

It has been estimated that identical twins are at least 20 times as efficient as ordinary pairs for studies on growth rate, and five to 50 times as efficient for studies on milk production. The use of identical twins will greatly lessen the time and expense required for experimental investigations. The benefits will extend to the entire dairy industry.

According to estimates, identical twin calves occur once in 1,000 births, which means that identical twin males or females should occur once in 2,000 births.

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Prospects for the third successive annual increase in numbers of spring pigs is reported as a result of census of hog farmers in the Midwest. An expected 6% increase over 1950 is forecast which will approach the record pig crop of 1943.

USDA Poultry Meat Inspection*

THIS report is to be construed only as a preliminary formulation and consolidation of the problems associated with the establishment of a uniform code for the sanitation and inspection of poultry and poultry products. The committee members have individually submitted their thoughts which have been resolved into this report.

It is the consensus that poultry inspection and sanitation, although intimately associated with the grading of poultry as defined in the present federal regulations, is a separate and distinct phase of the task of getting a wholesome product to the consumer. With this as a basis, the Committee recommends that inspection and grading be identified as two separate phases of poultry operations.

In as much as the words "condition and wholesomeness" have previously been used synonymously, the Committee felt there are no factors of "condition," which when related to public health significance, would not in themselves render a bird either wholesome or unwholesome. In this respect the Committee recommends that words of dubious or questionable intent be eliminated, and specifically suggests that "condition" as an expression of public health significance be eliminated.

It is suggested that "dressed poultry," allowing the retention of the intestinal tract and the contents during storage and shipment, be eliminated as unsatisfactory. This procedure permits of the absorption of toxic products, foul odors and bacterial contamination of edible flesh. Poultry to be eligible for shipment would have to be "Eviscerated—Ready-to-Cook" or be alive and healthy. If eviscerated, poultry would have to come from an inspection service following comparable or higher lines of requirement than the importing department concerned or have been inspected (used advisedly) by the United States Department of Agriculture.

The Committee further avers that all poultry entering into interstate commerce, if killed, should be federally inspected. If there is need for inspection of "red meats," shipped interstate, poultry meat requires no less and this committee recommends such congressional action as may be needed.

In considering a uniform code for poultry inspection and sanitary requirements of a poultry meat plant, the Committee looked into the present federal administrative setup with regard to both the inspection of "poultry meats" and "red meats." This was necessary for an exception was to be granted in the code for federally inspected "poultry meats" if properly inspected. It was found in the case of "red meats" that the Meat Inspection Division, Bureau of Animal Industry, Agricultural Research Administration conducted all inspection and enforced sanitation and that this also covered "voluntary" programs such as dog food certifications. It was further found that all "red meat" grading services were handled by the Livestock Branch, Production and Marketing Administration. After due consideration of the facts now existing with respect to poultry grading and inspection, the Committee recommends that to make a uniform poultry code workable and acceptable nationally the following be considered:

1. Continue the grading of poultry under the Poultry Branch of the Production and Marketing Administration.

2. Recommend that all inferences with regard to inspection in connection with grading be deleted from the future activities of those associated with the grading process in a manner similar to which it has been disassociated in "red meat grading."

3. Permit no grading of killed poultry by federal authorities unless such poultry has been inspected previously by the United States Department of Agriculture or an agency observing the same, or similar, regulations. This would be identical to the procedure now followed with respect to the grading of "red meats."

4. Transfer the "poultry meat" inspection to the Meat Inspection Division, Bureau of Animal Industry, Agricultural Research Administration to be handled in a manner similar to the inspection of "red meats" and "dog foods" and not in a lesser manner than either with respect to inspection procedures.

It is to be noted in connection with the above four recommendations that within the

*Report of the Committee on Poultry Inspection and Sanitation at the Fourth Annual Conference of Public Health Veterinarians, 78th American Public Health Association, October 30, 1950, Hotel Jefferson, St. Louis, Mo., by Oscar Sussman, Trenton, N. J., chairman; Martin D. Baum, Denver, Colo.; E. R. Price, Jefferson City, Mo.; Kenneth Young, Austin, Tex.; Leroy Davenport, Springfield, Ill.; James Lieberman, Washington, D. C.; and Sarah Vance Dugan, Louisville, Ky.

Agricultural Research Administration there now exist the functions of animal (livestock) and poultry disease research; that, therefore, these recommendations would be in fundamental accord with most of the existing functions of the United States Department of Agriculture.

It was felt there is a place for the employment of lay inspectors provided they are qualified, properly supervised, and government employed. The Committee was unanimous in the feeling that persons inspecting for wholesomeness should not under any circumstances be employees of the concern whose products they are condemning when unwholesome. The Committee felt the procedure of inspection for wholesomeness is essentially a governmental function and is certainly a governmental function when a government seal is placed on the product assuring the consumer of the wholesomeness of the product. The Committee felt this fact was true whether implied by wording on the label or by inference in the regulations under which the label is applied. With respect, further, to the extension of the use of lay inspectors in the inspection procedure, it was felt that this must be accomplished by carefully analyzed placement methods. It is realized that lay inspectors can be trained to detect abnormalities; that it would not be feasible or practical to train lay inspectors to determine whether any given bird with an abnormality may be passed as wholesome. It, therefore, would be practical to use lay inspectors only in the following situations:

a. Where a veterinary inspector is immediately available to make final disposal of abnormal carcasses.

b. Where the management will permit the condemnation of all abnormal carcasses.

c. Where the viscera of abnormal birds may be retained with the carcass with a minimum of confusion and necessary space and equipment.

d. Where lay inspectors are used on purely sanitary enforcement and temperature control procedures for which the need of pathological knowledge is minimal.

The Committee regards the unprecedented action taken by the Production and Marketing Administration in permitting the "federal grade labeling" of uninspected eviscerated poultry as poorly thought through, if at all, and that subsequent attempts to correct deficiencies, readily apparent in the original regulations promulgated January 1, 1950, have served only to confuse the issue to a greater extent. The United States Department of Agriculture failed to heed the advice of the majority of organized health groups and in the opinion of the committee this was an unwarranted attempt to "foist" grading upon the public in lieu of inspection or at the most a substitution of "company inspection for wholesomeness" for the efficient, uniform and adequate federal inspection previously maintained.

The following organizations have registered their protests to the administration to no avail: State and Territorial Health Officers Conference (representing all territories and states), United States Public Health Service, Federal Food and Drug Administration, United States Army, New York Conference of Food and Drug and Health Officials (includes New York, New Jersey and Connecticut), New Jersey Health Officers Association, American Veterinary Medical Association, United States Livestock Sanitary Association, New Jersey Health and Sanitary Association, and many state departments of health have raised specific objections.

The Committee is cognizant of the fact that in all the resulting confusion the poultry industry is holding the proverbial bag. It is believed that the majority of the industry have not been fully informed of the consequences of the action taken by the U. S. Department of Agriculture, Production and Marketing Administration. The Committee feels that by cooperative efforts of this committee, representatives of organizations actually representing the majority opinion of health and food and drug officials, and representative members of the entire poultry industry, that a uniform inspection code can be worked out that will benefit both the industry and the consumer. That such a code will remove all misleading, deceptive and contradictory statements with respect to wholesomeness.

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The government purchased 31,000,000 bushels of potatoes for price support by mid-December last year (1950). This is more than twice as many as were bought by the same date in 1949. Bumper crops, averaging more than 22 bushels per acre above the 1948 record, caused the total production to top the 1949 yield even though the acreage was down 4%.—*Agr. Sit.*, January 1951.

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The addition of synthetic methionine at the rate of 1.5 and 3 lb. per ton of feed to two practical types of starting and growing rations proved of no significant value in tests involving a total of approximately 2,100 chicks of four breeds when the chicks were grown to seven and eight weeks of age.—*Bimonthly Bul. N. Dak. Agr. Exp. Sta., Nov-Dec. 1950.*

Cell Types Present In Milk Of Cows In A Chronic Staphylococcal Mastitis Herd*

H. E. ADLER,** B.S., D.V.M. and HOYO MIGAKI,** B.S., M.S., Pullman, Washington

MILK from the bovine udder contains cells that come from the body of the producing animal. Their exact nature is still disputed by many investigators. Considerable divergence of opinion prevails concerning not only total numbers of cells but individual types in both normal and abnormal milk, although the problem of cell content of milk, the secretion of milk, and the histology of the mammary gland have been subjected to intensive study by workers over a period of years. The majority of cells found in milk are most commonly considered to be leukocytes because of their general appearance microscopically in stained smears of milk prepared using conventional and simple standard methods.

Many investigators have concluded that there is no marked difference in the cell picture of normal and mastitic milk except that of a quantitative increase from an inflamed quarter. Hewlett, *et al.*,[1] stated the belief that epithelial cells from the mammary gland form the main part of the cellular constituents of normal milk, and that leukocytes are not present. Hopkirk,[2] Duran-Jorda,[3] and many others, regard all cells present in milk as leukocytes and give little attention to epithelial cells. Still others, Breed[4] and Varrier and Jones[5] consider both epithelial cells and leukocytes as cellular constituents of normal milk. Breed believes that cells discharged in milk are of two types: the larger number of them are leukocytes, while a smaller percentage of them are epithelial cells, cell nuclei, or fragments of such cells. Holm,[6] Hadwen and Gwatkin,[7] and Zlotnik[8] believe that leukocytes are absent or present only in negligible numbers in normal milk, and that the appearance of any polymorphonuclear leukocytes in appreciable numbers is indicative of mastitis.

Zlotnik presents a unique interpretation of cell types in milk, introducing as new "pseudopolymorphs" or multinucleated epithelial cells and "micro-pseudocells" originating from the epithelial lining of the mammary gland. He holds to the belief that neutrophils are not present in normal milk in excess of 2 to 3%. In both normal and abnormal milk, however, he found epithelial cells forming a larger proportion of the cellular elements. Hadwen and Gwatkin showed that a differential study of the cell picture was of significance and value in determining the extent of the mastitic condition, as well as the degree of resistance to infection on the part of the host. They also observed that, in general, the proportion of mononuclear to polymorphonuclear cells tended to be somewhat higher in streptococcal than in staphylococcal mastitis.

It is the purpose of the present investigation to determine specific cell types present in milk from cows included within a herd which has had a long history of a high incidence of staphylococcal mastitis and to attempt to establish, if possible, a cell picture of milk from cows within this limited group.

Experimental Procedures

Milk samples were obtained from cows in the college dairy herd at the State College of Washington. The herd had been followed and studied for a number of years by McCulloch;[9,10] records have revealed that there exists a relatively high incidence of chronic subclinical staphylococcal mastitis in this herd.

Individual quarters of udders of each cow from which samples were withdrawn were examined while empty and palpated for fibrosed areas. The breed, age, stage of lactation, and physical condition of each cow were recorded.

Samples of fore-milk were withdrawn from each quarter preceding the regular morning milking. Prior to sampling, the teats were washed with calcium hypochlorite solution, separate paper towels being used for each cow. The first few streams of milk were discarded, and samples of approximately 10 ml. amounts were collected in sterile, screw-cap milk tubes. Laboratory examination was begun immediately after collection of the samples.

Each sample was subjected to bacteriological studies involving plating dilutions of the milk sample in 5% defibrinated horse blood agar. Dilutions were made in blanks containing ster-

*Scientific Paper no. 955, Washington Agricultural Experiment Stations, Institute of Agricultural Sciences, the State College of Washington, Pullman.

**College of Veterinary Medicine, The State College of Washington.

ile tryptose broth. After 48 hours' incubation at 37 C., the plates were examined and colony counts were recorded. Preliminary differentiation of colonies was based on hemolytic activity, size, form, and by microscopic examination of stained smears. Plates were held for an additional 48 hours to allow growth determination of possible diphtheroids or slow-growing microorganisms. Representative hemolytic colonies were routinely picked and isolations were subcultured on stock culture agar for further identification. In most cases the predominating organism was *Micrococcus pyogenes aureus* (*Staphylococcus aureus*). Coagulase tests were later made on subcultures of such isolations; an average of 80% of the cultures were strongly coagulase-positive.

Immediately following the plating procedures, smears to determine total cell counts were made for each sample, using the technic specified for the direct microscopic method in the Standard Methods for the Examination of Dairy Products[11]. The smears were stained with Newman-Lampert formula 2 stain. Microscopic examination was made according to Standard Methods.

Concurrently with the preparation of smears for the total cell count, the samples were prepared for differential cell-count smears. Approximately 5 ml. quantities of each sample were poured into centrifuge tubes and centrifuged at a speed of 3,000 r.p.m. for 15 minutes. The cream layer and supernatant were carefully removed and the sediment was retained. A loopful of sediment was deposited on a clean glass slide and spread thin over the surface. The film was air-dried, quickly heat-fixed, and immediately stained. Samples of cream from the centrifuge tubes were examined occasionally and were found to contain but a negligible number of cells. Numerous cells were noted, in some samples, at the interface between the cream and milk layers.

The staining technic employed in the studies was the peroxidase stain devised by Sato and Sekiya[15]. This stain was incorporated with the Giemsa stain[16] as a supplementary aid for simpler and more accurate differentiation of the cell types. Duplicate smear preparations of many of the samples were stained with Giemsa and with Wright-Giemsa combination stains for purposes of comparative reference. Reactions of the staining solutions were checked periodically by staining bovine blood smears.

The numbers of cells present in each of the following cell types were recorded for the differential analyses. Wherever possible, a total of 100 cells was counted. Peroxidase-positive and negative members within a group were recorded separately.

a. Epithelial Cells. The majority of cells within the group were peroxidase-negative; a few showed a peroxidase-positive property. Epithelial cells are those derived from the acini and duct linings of the mammary gland; they vary in size from 10-25 microns; their nuclei are generally spherical or elliptical, or sometimes distorted. The amount and nature of the cytoplasm are subject to variation. Degenerating cells often display a distortion of the nuclei, presenting appearances similar to nuclei of true polymorphonuclear leukocytes.

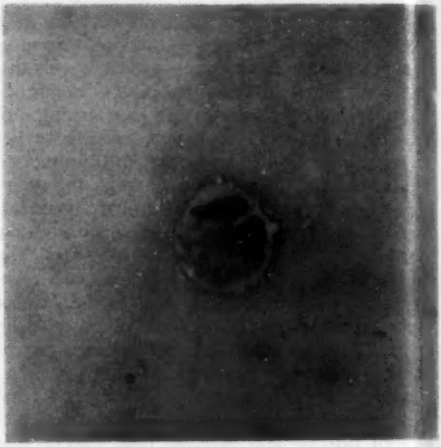

Fig. 1. Peroxidase positive granules in a leukocyte using the peroxidase-Giemsa stain.

Fragments and free nuclei of epithelial cells include a number of structures from degenerating cells and/or nuclei.

Large epithelial cells. These are the largest cells present in milk; they range in size from 30-60 microns or more, are of undeterminate shape, with a nucleus very small in comparison to the total size of the cell.

Macrophage-type cells. A number of the peroxidase-positive cells placed within the epithelial cell classification showed morphological characteristics similar to those of macrophages. Evidence of phagocytic action was frequently seen in these cells. For purposes of simplicity, however, these cells were left in their original classification as peroxidase-positive epithelial cells.

b. Polymorphonuclear Leukocytes. All of the cells within this group showed a strong peroxidase-positive property. In size, they range from 8-12 microns; their cytoplasm stains

lightly, their characteristically stained nuclei with lobes connected by fine threads serve to identify these cells readily.

c. Mononuclear Leukocytes. The cells within this classification include the lymphocytes and monocytes; all were peroxidase-negative. The lymphocytes are generally spherical in shape and range in size from small to large. The amount of cytoplasm is usually small and

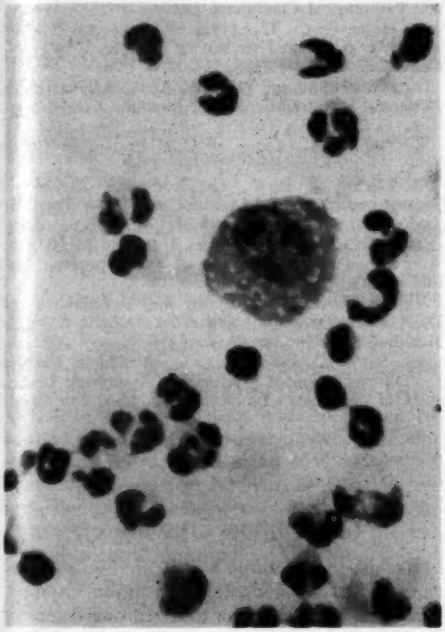

Fig. 2. Wright-Giemsa stain of milk sediment from a mastitic quarter. There are a large epithelial cell, numerous polymorphonuclear cells and a few lymphocytes.

appears as a narrow rim faintly surrounding the nucleus. Monocytes were seen but occasionally; their appearance was similar to that in blood smears.

d. Pseudopolymorphonuclear Cells. This cell type, described by Zlotnik as degenerated epithelial cells possessing nuclei so distorted that they resembled nuclei of true polymorphonuclear leukocytes, was included in the preliminary study and differentiation.

Results

Of a total of 135 individual samples examined which were obtained from cows within a lactation period of between 20 and 318 days, the following relationships were observed:

Low total cell count, low bacterial count, low % polys (Normal cows)	33
Low total cell count, low bacterial count, high % polys	31
Low total cell count, high bacterial count, low % polys	5
Low total cell count, high bacterial count, high % polys	11
High total cell count, high bacterial count, high % polys	28
High total cell count, high bacterial count, low % polys	0
High total cell count, low bacterial count, high % polys	21
High total cell count, low bacterial count, low % polys	6

A high total cell count is defined as one in excess of 500,000 per ml.; a high bacterial count, more than 3,000 per ml.; and a high percentage polymorphonuclear rating, more than 20-25% peroxidase-positive, polymorphonuclear cells per 100 cells in a differential smear.

Discussion and Summary

The results obtained in the present study revealed that: (1) a high bacterial count coupled with a high total cell count was shown to be accompanied by an increase in percentage of polymorphonuclear leukocytes; (2) a high total cell count is, as a rule, indicative of a relatively high percentage of polymorphonuclear cells, but is not indicative of a high bacterial count; (3) a high percentage of polymorphonuclear cells may or may not be accompanied by a high bacterial count, although a high bacterial count is nearly always accompanied by an increased percentage of polymorphonuclear leukocytes. In cases of chronic staphylococcal mastitis investigated, the individual bacterial counts and total cell counts were subject to variation; the high percentage of polymorphonuclear leukocytes present appeared to be the least variable characteristic.

Milk from clean, noninfected animals showed a low total cell count, low bacterial count, and an absence or negligible number of polymorphonuclear leukocytes. The larger proportion of cells present were epithelial cells, their free nuclei, and cell fragments. In staphylococcal infection of the udder, there is seen a marked increase in numbers of polymorphonuclear leukocytes; this sharp increase is apparent even though the condition has not yet advanced to a clinical state and seems a more sensitive indicator of the mastitic condition than either a total cell or bacterial count.

The percentage of polymorphonuclear leukocytes was significantly higher than any percentages reported by other workers for cases of streptococcal mastitis. This observation is in agreement with that of Hadwen and Gwatkin, who stated that "the characteristic appearance of staphylococcal infections in milk under the microscope is a multitude of polymorphonuclear leukocytes." Examination of milk smears stained with the peroxidase-Giemsa method revealed that the majority of so-called "pseudopolymorphonuclear cells" of Zlotnik are peroxidase-positive and strongly suggestive of being true polymorphonuclear leukocytes. The percentage of peroxidase-positive polymorphonuclear cells was high in the majority of the subclinical cases compared with that of normal control animals within the same age group and stage of lactation.

An interesting observation made in the course of microscopic examination of milk from chronic cases of mastitis was the almost complete absence of cocci phagocytosed by the polymorphonuclear cells. The few macrophage cells present did exhibit evidence of phagocytic activity. Hadwen and Gwatkin have suggested that absence of phagocytic activity might indicate a negative phase in the infection or a lack of resistance on the part of the host. In chronic staphylococcal mastitis, the abnormal condition generally remains macroscopically inapparent; it may be evidenced only by varying degrees of leukocytic infiltration into the milk, by presence of bacteria, or by excessive numbers of body cells. These factors indicating abnormality must be determined microscopically, and even under such examination they may not be present in sufficient numbers or degree to confirm conclusively a mastitic condition. The presence of large numbers of cells, bacteria, or polymorphonuclear leukocytes does not necessarily preclude an immediate flare-up; the condition is a latent state, constantly present but often undetectable on gross examination. It is logical to assume, however, that acute conditions would easily occur when the resistance of the udder is at a minimum; in actuality, acute flare-ups are frequently seen in the herd under study. Chemotherapy provides but temporary alleviation of acute conditions; little or no response is effected following treatment of subclinical cases.

It would appear that considerations of the problem of chronic staphylococcal infections of the udder on bases of immunological phenomena and udder physiology and metabolism would prove highly desirable and of fundamental importance.

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Creeping Eruption

Results of a routine survey in Florida indicated widespread creeping eruption in man. This skin disease is due to migrating larvae of the dog hookworm, *Ancylostoma braziliense*. Over 8,000 cases have been reported in this state in one month.

The dermatitis termed creeping eruption is characterized by the presence of progressively developing thickened tracks in the skin, accompanied by severe pruritus. Several species of helminth parasites of dogs and foxes have been incriminated as causing the condition; though the principal one is *A. braziliense*. The condition occurs chiefly on the feet, legs, and gluteal region of children in warm climates and where moist, sandy soil conditions are found. It is of importance from a public health standpoint and from a veterinary aspect. The principal source of infection is from parasitized dogs.

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It has been observed that the incidence of acetonemia is high in some closely inbred herds of cattle.—*W. K. Wessels, D.V.M.*

The Toxic And Analgesic Effects Of Procaine Hydrochloride Administered Intravenously In The Dog*

L. MEYER JONES, D.V.M., M.S., Ph.D., Ames, Iowa

PROCAINE was synthesized by Einhorn in 1905 in searching for a less toxic substitute for cocaine. Procaine was used primarily for local anesthesia until 1940, when Lundy found that pruritus caused by jaundice in man could be relieved by 0.1% intravenous injection of procaine hydrochloride[1]. During the same year, Burstein and Marangoni[2] injected procaine hydrochloride intravenously in experimental dogs to decrease the incidence of ventricular fibrillation following the administration of cyclopropane anesthesia. In effect, this therapy decreased the irritability of the myocardium with a reduced incidence of cardiac arrhythmias and fibrillation. During the recent war, these and other uses were made of procaine hydrochloride intravenously. Following the war, there was continued study of the effects of procaine hydrochloride administered intravenously for many things, including analgesia in obstetrics and even for the production of surgical anesthesia.

For the latter purpose (surgical anesthesia), procaine hydrochloride was judged unsuitable because the effective dosage was too close to the toxic or convulsive dosage. Some of the indications for procaine hydrochloride intravenously in man are indicated in table 1, taken from Graubard, *et al.*[3].

Procaine hydrochloride seems to have been used with the greatest success in the treatment of spastic muscles arising either from trauma or congenital defects, and in the treatment of inflammatory conditions, such as arthritis, neuritis and bursitis. In addition to the indications listed in table 1, Burstein (1949) has found that procaine administered intravenously for both prophylaxis and treatment of cardiac arrhythmias during thoracic surgery has given outstanding results[4]. Essentially, this treatment depresses the cardiac irritability produced by cyclopropane, ether, chloroform and perhaps other anesthetics. To date, no sound applications of procaine hydrochloride intravenously have been identified in veterinary medicine.

Procaine is metabolized readily by the body tissues, particularly the liver. Recently, it has been discovered that a blood enzyme rapidly splits the procaine molecule into para-amino benzoic acid and diethyl-amino-ethanol. The latter has been presumed by several investigators to be the active fraction of the procaine molecule responsible for the production of analgesia at nerve block anesthesia. Both fractions of the procaine molecule may be metabolized.

One action of procaine which must not be overlooked from the clinical standpoint is the tendency to stimulate the central nervous system. This stimulation results in hyperexcitability or in convulsions. There seems to be considerable individual variation in susceptibility to this stimulation. A given dosage will stimulate some patients and not others.

TABLE 1. PROCAINE HCl HAS BEEN USED IN MAN AS AN ADJUVANT IN THE TREATMENT OF THE FOLLOWING SELECTED CONDITIONS:

A. Traumatic		
Fractures	Myofascitis	Postoperative pain
Sprains	Traumatic arthritis	Postdislocation arthralgia
B. Inflammatory		
Rheumatoid arthritis	Neuritis	Bursitis
Osteoarthritis	Dermatitis	Coronary disease
C. Miscellaneous		
Congenital spastics	Pruritus	Postoperative anuria
Paralysis agitans	Serum sickness	

Experimental Procedures

The objectives of this study were to identify the analgesic and toxic effects of procaine hydrochloride administered intravenously to the dog. By identification of the ranges of these effects, the clinician can better study the specific clinical application of procaine hydrochloride intravenously.

There were 14 dogs employed in these ex-

*Presented at the American Animal Hospital Association meeting, Denver, Colo., Apr. 24-27, 1950.

periments. They were held for observation for four weeks. During this period they were examined and treated, where necessary, for internal parasites. Their diet consisted of a balanced dried feed, plus raw meat. A critical factor in the experiments was measuring the rate of flow for intravenous injection. Small amounts of solution were measured by a Murphy drip bulb. Larger quantities of fluid were measured accurately by use of a "flowrator" (Fischer and Porter, Chicago, Ill.). The procaine unit of Graubard was used as the basic measurement of intravenous injection early in the study. Graubard found that human beings and dogs will metabolize approximately 4 mg./kg. during 20 minutes of time. Initially, the administrations were single units or multiples of the procaine unit of Graubard.

Several methods of measuring analgesia were employed. Six mechanical measurements of analgesia were used: that is, penetration by a 24 gauge hypodermic needle of the shaved skin of the back, the ear, the foot pad and the tail; introduction of a stylus into the nostril; and pinching of the claw. In addition to these, the somewhat more reliable heat lamp method of determining the pain threshhold was employed.

The general outline of the experimental administration of procaine hydrochloride intravenously in the dog is given in table 2. This table indicates that the initial group of experiments were prolonged infusions occupying as much as an hour. The other experiments were performed over shorter periods of time to determine if intermittent injections or very brief injections might not be suitable and thus avoid the disadvantages of prolonged infusion periods. Also lethal dose determinations by intravenous injection were made.

Results

Table 3 shows that analgesia as measured by a delayed response to the heat lamp was not successfully produced in dogs by the intravenous infusion of procaine hydrochloride until concentrations in excess of 20 mg./kg. of body weight were injected into the experimental dogs. The analgesia produced by these excessive dosages was of brief duration, namely four to 20 minutes. The movement of the dog during the infusion period varied from none to excessive. Movement identified as moderate to excessive was considered to be undesirable from the clinical standpoint because of convulsions, hyperexcitability, or tenseness and jerking of the skeletal muscles. Movement identified as none to slight could be tolerated during intravenous infusion. It appeared that excessive movement during injection, prohibiting the use of procaine hydrochloride intravenously, occurred at concentrations below those producing analgesia. Thus, it appeared that procaine hydrochloride could not be used as above to produce clinical analgesia. In these experiments procaine hydrochloride was injected in physiological saline in concentrations of 0.1 and 0.2%.

In table 4 are listed data measuring the analgesia by mechanical criteria that were observed in the trials listed in table 3. Data from only two of the six criteria are shown. All of these mechanical criteria confirm the measurements obtained from the use of the heat lamp.

TABLE 2. GENERAL OUTLINE OF THE EXPERIMENTAL ADMINISTRATION OF PROCAINE HCl INTRAVENOUSLY IN THE DOG

	Trials
1. Infusion using "procaine unit" (4 mg./kg./20 minutes) as a basis	21
2. Injection during one, three, five, ten minute periods at 7.5-35 mg./kg.	19
3. Injection during five, 15, 30 second periods at 7.5-100 mg./kg.	16
4. Lethal dosage determination by rapid injection at 35-200 mg./kg.	16
5. General observations: analgesia, toxicity, clinical responses	—
	72

TABLE 3. PRODUCING ANALGESIA IN DOGS BY THE INTRAVENOUS INFUSION OF PROCAINE HCl

Dog No.	Dosage in mg./kg./ 20 min.	Infusion time in minutes	Delayed response to heat lamp in minutes	Movement during injection
6	4	20	—	None
9	4	40	—	None
9	4	60	—	Slight
6	6	20	—	Slight
7	6	60	—	Moderate
7	8	6	—	Slight
1	8	8	—	Excessive
8	8	20	—	None
8	8	54	—	Excessive
5	8	60	—	Moderate
2	12	25	—	Excessive
4	12	52	—	Excessive
4	12	60	—	Moderate
5	16	60	—	Excessive
1	16	20	—	Excessive
5	20	8	—	Excessive
6	24	40	4	Excessive
9	36	20	13	Excessive
8	48	20	6	Excessive
2	60	20	10	Slight
8	80	20	20	Excessive
	—			
	21 Trials			

The clinical observations indicate that each patient showing analgesia also exhibited a convulsive or subconvulsive state.

Table 5 shows the results of intravenous injection of procaine hydrochloride over shorter periods of time. The analgesia produced by these experiments was variable. The individual variation of the patient appeared to be as great

TABLE 4. MINUTES OF ANALGESIA AND THE EFFECTS OF THE INTRAVENOUS INFUSION OF PROCAINE HCl IN DOGS

Delayed response to heat lamp	Penetration by 24 ga. needle: Dorsal skin	Foot pad	Clinical observation
4	3	0	Strong generalized tremors
6	4	2	Convulsions, anus relaxed
10	5	2	Convulsions; hyperexcitable; vomition
13	6	3	Restraint difficult; vomition
20	10	6	Convulsions; hyperexcitable

a factor as any. An example of this variation was observed during injections for three minute periods where only two out of four dogs showed analgesia without correlation to size of dosage. The concentration of the procaine solution injected was from 1 to 8%. The heat lamp could not be used successfully in measurement of analgesia during these brief injection periods, so the mechanical criteria alone were used. All of the dogs listed in table 5 evidenced hyperexcitability after injection except those receiving only 7.5 mg./kg. of body weight.

TABLE 5. MINUTES OF ANALGESIA AND THE EFFECTS OF BRIEF INTRAVENOUS INJECTIONS OF PROCAINE HCl IN DOGS

Dosage mg./kg.	Injection time	Penetration by 24 ga. needle: Dorsal skin	Foot pad	Movement during injection
30	10	7	2	Slight
7.5	5	0	0	Slight
15	5	4	2	Slight
15	5	12	10	Moderate
20	5	0	0	Slight
25	5	0	0	Slight
30	5	5	2	Slight
35	5	10	7	Excessive
35	5	15	12	Excessive
7.5	3	0	0	None
15	3	4	2	None
25	3	5	2	None
35	3	0	0	Excessive
7.5	1	2	1	None
15	1	10	4	Moderate
15	1	12	4	Moderate
25	1	11	4	Moderate
35	1	20	13	Excessive
125	1	Immediate Death		Excessive
	19 Trials			

All dosages caused hyperexcitability after injection except 7.5 mg./kg.

Table 6 shows the analgesia produced following the injection of procaine hydrochloride in 30 seconds or less. In these experiments the tendency for procaine hydrochloride to stimulate the central nervous system seems to override any analgesia that might be produced.

TABLE 6. MINUTES OF ANALGESIA FOLLOWING THE BRIEF INTRAVENOUS INJECTION OF PROCAINE HCl IN DOGS

Dosage mg./kg.	Injection time in sec.	Penetration by 24 ga. needle: Dorsal skin	Foot pad
7.5	30	2	0
15	30	7	4
25	30	0	0
35	30	18	10*
7.5	15	0	0
7.5	15	0	0
15	15	0	0
25	15	8	5
35	15	0	0
35	15	0	0
40	15	0	0
50	15	0	0
4	5	3	1
100	5	28	24
100	5	30	22
100	5	35	25
	16 Trials		

*Only one dog showed movement during injection. It was excessive.

All dosages caused hyperexcitability after injection except 7.5 mg./kg.

Analgesia noted was variable and infrequent, excepting at the very high dosage of 100 mg./kg. of body weight. The analgesia produced at this dosage was good and of long duration, but unfortunately was near the minimal lethal dose. The concentrations of the procaine solutions injected varied from 1 to 10%. All dosages in table 6 caused hyperexcitability after injection excepting 7.5 mg./kg. of body weight.

The normal average pulse rate of eight dogs was studied closely. Seven of the eight had a strong, highly irregular pulse. During the injection of procaine hydrochloride intravenously, the pulse of these dogs was increased in rate by two or three times and became regular. Following the injection, the pulse became slower, stronger and continued to be regular. The rate following the injection period still was above normal for 30 to 120 minutes, depending upon the size of the dosage.

Table 7 shows lethal dose experiments in dogs with intravenous injections of procaine hydrochloride solution in 10% concentration.

The minimal lethal dose in these rapid injection experiments was found to be between 100 and 105 mg./kg. of body weight.

Autopsy

At autopsy (table 8) the liver showed a marked hyperemia. This organ was engorged with blood so that injection of the surface permitted blood to flow freely from it. The liver was enlarged at least one and one-half times, and the spleen was enlarged sometimes as much as three or four times normal size. The kidneys and lungs showed a variable hyperemia. The left ventricle stopped in systole. The right ventricle was also dilated. The portal and coronary veins were markedly engorged with blood. There were no prominent lesions of other organs. It may be that the marked hyperemia of the liver could be explained by an

TABLE 7. LETHAL DOSE EXPERIMENTS IN DOGS WITH INTRAVENOUS INJECTIONS OF PROCAINE HC1

Dosage mg./kg.	Injection period	Terminus
80	20 min.	R
35	5	R
35	3	R
35	1	R
35	30 sec.	R
50	15	R
50	5	R
100	5	R
100	5	R
100	5	R
105	5	D
105	5	D
105	5	D
110	5	D
125	5	D
150	5	D
200	5	D
	17 Trials	

influence of procaine upon the sphincter or "pucker" valves of the liver sinuses[5].

Table 9 indicates the clinical signs of progressive toxicity observed in dogs following the intravenous injection of procaine hydrochloride.

Discussion

From these limited data it would appear that the intravenous injection of procaine hydrochloride in dogs holds limited possibilities in veterinary medicine. The analgesia produced by procaine hydrochloride intravenously in subconvulsive dosages was not regularly satisfactory for clinical usage. Dosages which would produce satisfactory analgesia were near convulsive amounts. Furthermore, analgesia did not occur regularly so individual variation would appear to be a factor hindering the clinical production of analgesia by procaine. More investigations are needed to show whether procaine hydrochloride has a beneficial effect upon the myocardium in rendering it more regular in beat and in decreasing its irritability.

Investigation is indicated regarding the usefulness of procaine hydrochloride intravenously

TABLE 8. GENERAL GROSS PATHOLOGY OBSERVED AT AUTOPSY IN THE FATALITIES FROM THE LETHAL DOSE EXPERIMENTS

Liver, Spleen	marked hyperemia; enlarged 1½ times
Kidney, Lungs	variable hyperemia
L. ventricle	usually in systole
R. ventricle	dilated
Coronary veins, Great veins	engorged
No prominent lesions of other organs	

in treating certain clinical conditions, such as the pruritus associated with chronic eczema or pruritus of the tail with automutilation.

The data reported herein do not demonstrate the production of analgesia in the dog in any way parallel to that observed in man. Species variance is the only apparent explanation. A careful search of medical literature reveals only a brief reference to the use of procaine hydrochloride in normal, unanesthetized dogs by Allen and Safford, 1948. These authors state that: "There is no such primary analgesia (in the dog) as observed with systematic dosage in man. On the contrary, reactions to painful stimuli are exaggerated. Procaine alone is entirely unsuited to systemic anesthesia . . . in the dog"[6].

TABLE 9. CLINICAL SIGNS OF PROGRESSIVE TOXICITY OBSERVED IN DOGS FOLLOWING THE INTRAVENOUS INJECTION OF PROCAINE HC1

1. Tremors of neck muscles cause shaking of the head; becomes pronounced.
2. Tremors of leg muscles; may develop into pronounced jerks ending injection.
3. Muscle weakness; incoordination; inequilibrium.
4. Analgesia—if any occurs.
5. Large dosages stimulate the C.N.S. replacing any analgesia with hyperexcitability, excessive muscle tone and convulsions.
6. Large dosages may double or triple the pulse rate.
7. Lethal dosages paralyze respiration immediately.
8. High lethal dosages induce ventricular fibrillation immediately.

Summary

1. Up to 6 mg./kg. 20 minutes were in-

jected with safety and without disturbing the dog either during or after administration.

2. Unfortunately, the above amounts of procaine hydrochloride did not produce analgesia in dogs as measured in these experiments.

3. Analgesia resulted from the intravenous injection of this drug up to 35 mg./kg. in one, three, five and ten minutes, but it was irregular in occurrence and lasted only a few minutes.

4. The same observations apply to procaine hydrochloride injected during shorter periods, *i.e.*, five, 15, 30 seconds.

5. What appeared to be a fair state of analgesia lasting six to 20 minutes resulted from the infusion of 36 to 80 mg./kg./20 minutes. Unfortunately, these concentrations produced convulsive muscular responses rendering this dosage impracticable from a clinical standpoint.

6. The dog's heart was stimulated to beat two or three times the previous rate by intravenous injections of 12 or more mg./kg. of procaine hydrochloride. An irregularly beating heart became very regular in its contractions.

7. The m.l.d. of procaine hydrochloride injected intravenously in dogs within five seconds approximates 100 mg./kg. of body weight.

8. At autopsy the enlarged liver and spleen engorged with blood constitute the greatest abnormality. A variable hyperemia was noted of the lungs and kidneys.

Conclusion

The results of these experiments indicate that procaine hydrochloride cannot be used to produce analgesia in the dog suitable for clinical procedures.

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Mechanical Aspects of Ear Treatment

A cotton swab is an inefficient instrument for cleaning the ear canal of a dog. The popular conception held by many clinicians—to continue mopping and swabbing until the swab comes clean—has much to condemn it.

Considering the physical structure of the ear canal and the aggravation caused to already irritated and inflamed surfaces by swabbing with cotton, Dr. W. W. Armistead (*Jour. Am. Vet. Med. Assn.*, 118:8 [Jan.] 1951) recommends a wire loop for removing accumulated debris. A simple loop of small gauge wire, the smallest gauge of "high treble" piano wire is excellent, serves the purpose. By careful manipulation through a long speculum attached to an otoscope, exudates may be removed with a minimum of irritation.

The author lists ten practical points for what may well be considered as a surgical operation for ear cleaning. Restraint and position of the patient is emphasized and the use of a standard type of otoscope is a must for best results. Attention to the upper portions of the canal easily visible is recommended. Hair that may obstruct the view, deter both drainage and aeration should be trimmed. Cleaning away exudates at the external meatus is mentioned. Selection of agents to dry or soften adherent materials are discussed, with advice for subsequent careful "fishing out" through the lighted otoscope of debris and any substances that might be irritating. A choice of chemotherapeutic agents is available for treatment following adequate cleaning, but little medicinal treatment is required in the majority of cases of otitis externa referred to the clinician. Overtreatment is a probable hazard that must be avoided.

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The lactobacilli found in the cecal feces of turkeys have been described recently by Harrison and Hansen in a series of three papers (*Jour. Bact.* 59:197-444, and 60:543, 1950). *Lactobacillus bifidus*, an obligate anaerobe was found to be the most numerous, while among the facultative anaerobes of the genus, *Lacto. acidalphilus* predominated. *Lacto. plantarum* and *Lacto. fermenti* were also encountered but in smaller numbers than the other two species. It is of interest that, in the turkeys studied by these investigators, *Lacto. bifidus* was the most prevalent species of all bacteria found in the cecal contents.

The Benefits In The Use Of Hyaluronidase In Hypodermoclysis

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INDICATIONS for the use of salines or other isotonic solutions are regularly observed in veterinary practice. For one reason or another, one fails too often to administer these parenterals. Each of the three routes of administration have their limitations in individual patients. Animals are sometimes difficult to restrain. It is generally agreed that fluids given intravenously produce minimum side reactions, but slow intravenous injection in puppies and in some dogs is time consuming and tedious, if not impossible. An attendant is usually necessary during a period of hours. For this reason it is frequently impractical.

Physicians have found that the use of the enzyme hyaluronidase has enabled them to use fluid to greater advantage. This is particularly true in pediatrics. Pediatricians regularly prescribe nutrients by hypodermoclysis with hyaluronidase in amounts comparable to those ordinarily administered intravenously. Hyaluronidase is an enzyme occurring naturally in testicular extract, spermatozoa, snake and bee venom, and in some strains of hemolytic streptococci. It lowers the viscosity of hyaluronic acid which is found in almost all animal tissue and acts as a simple tissue cement. By the use of this enzyme subcutaneously, the viscosity of hyaluronic acid in the injection area is lowered, which allows fluid to diffuse at an increased rate. With the application of this feature it is possible to administer fluid subcutaneously at one site and obtain rapid absorption with little subsequent swelling or discomfort to the patient.

When small quantities of serum or other isotonic solutions are to be injected, the contents of one ampule is dissolved and added directly to the solution to be injected. If larger quantities are to be administered subcutaneously, injection is started in the usual manner. After flow has started, 1 cc. of alidase (500 viscosity units—contents of one ampule) is injected into the rubber tubing, as shown above. In this manner the hyaluronidase is carried into the tissues at the beginning of the hypodermoclysis and is usually sufficient to enhance the absorption of up to 500 cc. of parenteral solutions injected at one site.

Case Reports

The following case reports illustrate advantages to be expected in the use of hyaluronidase with either forced injection of fluids or by the drip method.

Case 1. One five-week-old English Setter puppy was the last of the litter of five. Litter mates had died during the previous three days, and this puppy had eaten only half of her food that morning. On preliminary examination, there was definite evidence of a catarrhal rhinitis, also a smear from the thermometer indicated the presence of hook worms. Supportive treatment and an enema with butyl chloride added were given, but the point to emphasize is that 20 cc. of homologous distemper serum given to this puppy was administered subcutaneously in one area in the neck region. Before administering the serum, 1 cc. of alidase,* was added. Within 1½ hours, most of the swelling produced by this volume of material had subsided, and by the following morning no swelling or pain could be detected in the area. The puppy was released from the hospital one week later with no abscess nor thickness evident at the site of injection.

Case 2. A small five-year-old Boston Terrier was presented because of persistent vomiting. The owner said he thought the dog

*Alidase, brand of hyaluronidase in specially purified form, produced by C. D. Searle & Co., Chicago, is supplied in ampules as a dry powder. Each ampule contains 500 viscosity units of hyaluronidase and sufficient sodium chloride to make an isotonic solution upon the addition of 1 cc. of distilled water.

had drunk some plant spray. Dehydration in this highly nervous dog was profound and parenteral fluids, in addition to an antidote, were prescribed. A solution containing saline and 5% dextrose was given subcutaneously in the neck region. As the flow started, 1 cc. alidase was injected into the rubber tube just ahead of the needle. Twenty minutes were allowed for administration and when finished there was considerable swelling. At the end of one hour most of it had subsided, and in twelve hours, no indication nor reaction could be ascertained. The animal made an uneventful recovery.

As reported by the Searle Laboratories, the toxicity of alidase is extremely low. Sannella[1] observed the action of hyaluronidase is confined to the immediate area of its injection. Changes in viscosity of the intercellular substance initiated by hyaluronidase do not spread. No local nor general thermic reactions are provoked by administration.

Care should be exercised to avoid overwhelming the animal by too rapid an administration of fluid. To facilitate the spread and absorption of parenterally injected solution, hyaluronidase should be considered wherever fluid therapy is prescribed.

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Effects of Inhalation of Lindane Vapors upon White Mice

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This experiment was performed to help answer the question of toxicity of lindane vapors to man and animals when used as a residual spray.

Cylindrical wire mouse cages, 6" x 8", were placed within wooden boxes just large enough not to contact the wire cages. Rubber tubing was used around each cage to prevent accidental contact between cage and cover. The outer boxes were made with sufficient holes to provide 10% of the surface areas as ventilation.

The interior surfaces of each test cover were painted with 5% acetone solution of lindane containing 99.8% gamma benzene hexachloride to give a residue accurately measured of 1 gm. of gamma isomer per square foot. This rate of residual application is 20 to 40 times the amount recommended by the Bureau of Entomology and Plant Quarantine for controlling flies and other insects.

Each four weeks the treated covers were thoroughly cleaned by washing with acetone, allowed to dry, and then retreated. Three mice, two females and one male, occupied each cage. All cages were kept in a room with a temperature of 74 F. to 77 F. Offspring and history of the mice are shown in table 1, with the following exception:

Apart from table 1, the first litter of mice born in cage no. 3 on January 12, 1950, consisted of three females and two males. They were kept in cage no. 3 until February 13, 1950, when they were separated from their parents and placed in a similar cage with the interior cover surface being treated in the specified manner.

TABLE 1

			Offspring			
			Born		History	
Cage No.	Adult mice Begin	End	Litters	No.	Living at end exp.[1]	Failed to survive
1-Control untreated	3 2F. 1M.	3	1	5	—	—
2-Treated lindane 1 gm/ft²	3 2F. 1M.	3	1	4	2	(1 dead at birth 1 died from injury inflicted by two males.)
					2	
3-Treated lindane 1 gm/ft²	3 2F. 1M.	3	4	23	19	(1 dead at birth 3 eaten by adults.)
					4	

[1]Offspring of the control animals were accidentally discarded in the litter following birth.
F. female; M. male.

These three females, upon reaching maturity, were bred by the two male litter mates and, in turn, had one litter of young each. Two of these litters were born on March 23, 1950, and consisted of five mice each. The other litter, consisting of seven mice, was born on March 31, 1950. This made a total of 17 mice in the F_3 generation and, at the close of the experiment on April 10, 1950, these 17 mice in the F_3 generation, or the grandchildren of the original adults in cage no. 3, were apparently normal and in good health.

(*Continued to page* 104)

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Observations On The Etiology Of Yellow Fat Disease In Mink: Preliminary Report

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THIS disease has been called various names such as nonsuppurative panniculitis (Weber Christian disease),[1] fatty degeneration of the liver,[2] watery hide disease,[3] and steatitis[4]. Workers at Wisconsin included the condition in a syndrome with hemorrhagic gastroenteritis, anemia, and acidosis[5]. While the disease has many names, the etiology has remained obscure.

Hartsough and Gorham[4] have been able to control an outbreak successfully by changing the ration so that it contained a large amount of fresh, unfrozen horsemeat and additional fresh liver, and by limiting the food intake of affected individuals. This treatment proved successful, but the actual cause was not known. Leekley[3] reported that he was able to control watery hide disease in Alaska by replacing the halibut and salmon in the ration with flounders.

In 1944, Henrik Dam[6] noted the development of a yellowish-brown pigment in the adipose tissue of chicks and rats. This preliminary observation was closely followed by the subsequent reports of Mason, *et al.*,[7] and Granados and associates[8]. The significant fact in these papers was that rats raised on vitamin E-deficient diets containing highly unsaturated fatty acids, developed an acid-fast pigment in the adipose tissue.

Upon reviewing sections of experimental[9] and natural-occurring cases of yellow fat disease in mink, it was found that histological changes and the occurrence of acid-fast pigment were similar to those the above workers had experimentally produced in rats. These observations also have been made recently by Hartsough and Mason[10].

In Washington, Oregon, and Alaska, the disease is usually seen where ranchers have fed large amounts of fish scrap in the ration. It was postulated that the fish provided a rich source of highly unsaturated glycerides, and that the complete ration contained inadequate amounts of vitamin E.

With the histological correlation and the postulation just described in mind the authors undertook experiments to test the effectiveness of tocopherols as a means of preventing the occurrence of the disease. The results of these studies are presented below.

Deficiencies of vitamin E have been shown to be responsible for the development of acid-fast pigment in the adipose tissue of mink fed rations containing a high percentage of fish scrap.

The biochemical, histochemical, pathological, and hematological aspects of the malady will be presented in subsequent reports. Analyses of the fish scrap to determine the content of unsaturated fats were begun but results are not available at this time. The clinical picture has been adequately described in a previous paper[4].

Materials and Methods

Animals. Healthy young mink, averaging eight to nine weeks of age, were selected at random from the stock colony. Before the trials were begun, several of these animals were sacrificed, and no gross or microscopic abnormalities were observed. The mink were housed in conventional pens in a cool colony house. They were given approximately 225 gm. of food per day, divided into two portions.

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Water was available at all times. Prior to the time they were placed on the experimental rations, they were suckling the dam and/or eating the regular ration which had fresh frozen horse meat and liver as a meat source.

Experimental Rations. In experiment I, the mink were divided into four groups of 22 each. The basal ration used in this experiment consisted of fresh frozen ocean fish scrap, 85%; commercial mink cereal, 13%; and brewers yeast, 2%. The fish scrap used was the same product that is commonly used as a source of meat for mink in this area. It is impossible to know the types of fish and percentages of these types, since the fish is ground and frozen in blocks. A single block may contain any or all of the following kinds of fish[11]: Petrale and English sole, black rock cod, red rock, ling cod, and flounders. The livers are usually removed from the fish.

In addition to the basal ration, each mink in these four groups received a daily dose of 1 cc. of a commercial fish oil, containing 3,000 I.U. of vitamin A and 1,000 I.U. of vitamin D per gram. The oil was given *per os* with a glass syringe. The doses were omitted every seventh day during the course of the experiment.

These oil doses served also as a vehicle for the administration of tocopherols in this experiment. The tocopherols fed were in the form of a distilled type IV concentrate containing mixed natural tocopherols prepared from vegetable oils. The concentrate had a potency of 340 mg. mixed tocopherols per gm.

The tocopherol concentrate was mixed with the desired quantity of fish oil every second day to prevent possible destruction of the tocopherols by the oil. The concentrate was added in proportions such that a 1 cc. dose of fish oil contained the desired daily dose of tocopherols. The tocopherol concentrate, fish oil and mixtures were stored at 5 C.

The four groups of mink in this experiment received the following rations:

Ration I. Basal ration plus 1 cc. fish oil per mink per day.

Ration II. Basal ration plus 1 cc. fish oil containing 3 mg. tocopherols per mink per day.

Ration III. Basal ration plus 1 cc. fish oil containing 10 mg. tocopherols per mink per day.

Ration IV. Basal ration plus 1 cc. fish oil containing 20 mg. tocopherols per mink per day.

In experiment II, wheat germ meal was incorporated in the ration to provide a more practical method of supplying vitamin E under farm conditions. In this experiment, the fish oil was mixed as a part of the ration. Twenty mink were divided into two groups; their experimental rations are designated rations V and VI and contain the following constituents:

Ration V. Fish scrap, 83%; commercial mink cereal, 10%; brewers yeast, 2%; wheat germ meal, 5%; fish oil, 1 cc. per mink per day. (The wheat germ supplied approximately 3 mg. tocopherols per mink per day.)

Ration VI. Fish scrap, 80%; commercial mink cereal, 8%; brewers yeast, 2%; wheat germ meal, 10%; fish oil, 1 cc. per mink per day. (The wheat germ supplied approximately 6 mg. tocopherols per mink per day.)

Demonstration of Pigment. The quantitative degree of pigmentation in the adipose tissue was observed grossly at necropsy and recorded. Portions of this tissue were removed from the area immediately anterior to the stifle joint and were fixed in 10% formol-saline. Paraffin sections were cut at seven microns and stained with Harris hematoxylin and Verhoeff's carbol-fuchsin by the acid-fast technic. On microscopic examination, the acid-fast pigment in the sections was recorded as trace, +, ++, and +++, according to the amount present.

Results

The mink in experiments I and II were placed on the experimental rations July 6,

TABLE 1. NUMBER OF MINK WITH ACID-FAST PIGMENT IN ADIPOSE TISSUE

Degree of pigmentation	Ration I Basal	Experiment I			Experiment II	
		Ration II Basal plus 3 mg. tocopherols	Ration III Basal plus 10 mg. tocopherols	Ration IV Basal plus 20 mg. tocopherols	Ration V with 5% wheat germ meal	Ration VI with 10% wheat germ meal
Negative	1	11	21	22	3	10
Trace	0	11	1	0	6	0
+	7	0	0	0	1	0
++	6	0	0	0	0	0
+++	8	0	0	0	0	0
Total number of mink	22	22	22	22	10	10

1950. Experimental feedings were concluded September 22, 1950, at which time the surviving mink were sacrificed. Table 1 shows the degree of acid-fast pigmentation which was observed microscopically in the adipose tissue of the mink receiving the six rations in experiments I and II. In the categories designated +, ++, and +++, there was a close correlation between the degree of pigmentation observed grossly and microscopically. In the trace group, the acid-fast pigment could be seen only microscopically. Pigment formation was marked in the basal control group in which no tocopherols were added.

As the amount of tocopherol supplementation was increased, there was a corresponding decrease in pigment formation. In the animals on ration IV there was a total absence of pigment.

In the control group, four mink succumbed, and all had marked pigment formation. There was no mortality in the animals on rations II and III. On ration IV, two animals died. One mink chewed its tail and died of septicemia; the other became emaciated and succumbed. In neither individual was seen either gross or microscopic evidence of pigment formation. On ration V, one animal died; pigment formation was noted microscopically. On ration VI, there was no mortality.

At the close of the experiment, three young mink that had been on the stock ration used at this station, which had horsemeat and liver as a meat source, were sacrificed. In none of these animals was gross or microscopic pigment formation observed.

Discussion

The most significant finding in "yellow fat" disease in mink is the appearance of an acid-fast pigment in the fat depots. It is apparent from the data presented that the addition of an adequate level of vitamin E to the basal ration prevented the formation of this pigment in adipose tissue.

Although it appears probable that vitamin E plays a definite role in the etiology of this nutritional disease, it is possible that other factors may be involved as these rations containing high percentages of fish scrap did not promote as rapid growth as did the stock ration.

The death losses in the control (ration I) group are within the limits of mortality percentages occurring in field outbreaks, but it may well be that the deaths in this and other groups (rations IV and V) were influenced by some additional factor other than tocopherols.

Studies have been initiated to determine the amount of vitamin E that is supplied by the fish scrap and cereal portions of the diet. Only the amounts of tocopherols from known sources, *i.e.*, the concentrated, mixed, natural tocopherols and the wheat germ meal, were calculated in these experiments.

Summary

Young mink placed on rations containing high percentages of fish scrap developed an acid-fast pigment in the adipose tissue. These changes did not occur when the diet was supplemented with an adequate level of vitamin E.

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Shifting Ballyhoo

The results of large scale scientific tests of the efficacy of antihistamines in the treatment of colds are now available. The verdict: "There is still no cure for the 'common cold.'" The sequel: much advice on the air waves as to how to "help relieve the miseries of a cold." It is unlawful to sell a cure or even a treatment for a cold, but meritorious to battle that old enemy "miseries" even with a lead pipe.

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A record attendance of 915 persons registered for the sessions of the Iowa Veterinary Medical Association at Des Moines, January 17-19, 1951, of which approximately 210 were ladies of visiting practitioners of the state.

Experimental Immunization Of Chickens With Combined Whole Embryo Newcastle And Fowl Pox Vaccines

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BRYAN[1] described a whole embryo fowl pox vaccine in 50% buffered glycerol that was satisfactory for immunization of chickens. Suspensions of 5% and 10% infected whole embryo remained viable for 25 months at 5 C. Prier and Alberts[2] reported that 20% suspensions of Newcastle disease infected whole chick embryo in 50% buffered glycerol (pH 7.6) remained viable for over 353 days at 5 C. These suspensions produced satisfactory immunity in chickens after 384 days of storage.

The results of a study to determine the immunizing capacity of combined fowl pox and Newcastle whole embryo vaccines in 50% buffered glycerol are presented in this report.

Materials and Methods

Preparation of the Vaccines. The strain of fowl pox virus used was isolated from a field outbreak of the disease and cultured in chick embryos. Whole embryo suspensions were lyophilized and held at 10 C. for over 12 months. The lyophilized cultures were reconstituted and used to inoculate chick embryos in the preparation of the vaccine. The Newcastle disease virus was a strain isolated from an outbreak in an Illinois poultry flock and maintained for 14 passages on duck embryos. Ten-day-old duck embryos were inoculated with either fowl pox virus on the chorioallantoic membrane or Newcastle disease virus in the allantoic sac. All inoculated eggs were candled daily. Fowl pox-infected embryos were harvested after four days of incubation and the Newcastle disease embryos after two days of incubation. Fowl pox-infected embryos dead during the first three days after inoculation and Newcastle disease embryos that died the first day after inoculation were discarded. All satisfactory eggs were held in a refrigerator at 5 C. for 24 hours before harvesting.

In harvesting, the surface of an egg was disinfected with alcohol and the cap or air cell end of the egg shell removed. The entire contents of the shell were then placed in a Waring blendor and mixed to a homogenous consistency. Ten ml. of the Newcastle virus suspension and 10 ml. of the fowl pox virus suspension were added to 80 ml. of 50% buffered glycerol. The glycerol diluent was prepared by dissolving 1.62 gm. of anhydrous potassium dihydrogen phosphate in 375 ml. of glycerol (C.P.) and 375 ml. of distilled water. Vaccines were stored at —17 C. prior to use. Separate fowl pox and Newcastle vaccines were prepared by adding 10 ml. of the respective embryo suspensions to 90 ml. of the glycerol diluent.

Experimental

The chickens used in these experiments varied in age from four to 12 weeks. All vaccinations were made by the two prong wing-web stick method. Both combined Newcastle-fowl pox vaccines and separate fowl pox and Newcastle vaccines administered simultaneously were used in different groups of birds. Unvaccinated controls were retained for each experiment. Vaccinated birds and controls were challenged four weeks after vaccination. In challenging the vaccinated birds, each group was divided into at least two sub-groups. Each sub-group was then challenged with either fowl pox or Newcastle disease virus.

Fowl pox challenge was done by scratching a few drops of virulent virus suspension (infected whole embryo) into the skin of the face. Newcastle challenge was accomplished by intramuscular inoculation of 0.5 ml. of a 10^{-4} dilution of infected allanto-amniotic fluid. One week after challenge with fowl pox the birds were examined for swelling and scab formation at the site of inoculation. Death or paralysis indicated a "take" in Newcastle challenged birds. Challenged birds were observed for four weeks.

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The technical assistance of Mr. Gerald Dart is acknowledged.

Results

The results are recorded in table I. A total of 235 birds was used in these experiments. Sixty-six birds were vaccinated with combined fowl pox-Newcastle vaccine. Fifty birds were vaccinated for fowl pox vaccine alone and 60 birds were vaccinated with Newcastle vaccine alone. Twenty of the birds vaccinated with the combined vaccine were challenged with fowl pox virus and 20 were challenged with Newcastle disease virus.

TABLE I. VACCINATION OF CHICKS WITH COMBINED FOWL POX-NEWCASTLE DISEASE WHOLE EMBRYO VACCINES

No. Birds	Age in Weeks	Vaccine	Deaths Following Vac.	Challenge Virus	% Protection
10	6	NC	0	FP	0
10	6	NC	0	NC	100
10	6	NC	0	None	—
10	6	FP	0	FP	100
10	6	FP	0	NC	10
10	6	FP	0	None	—
10	6	FP+NC	0	FP	90
10	6	FP+NC	0	NC	100
10	6	FP+NC	0	None	—
10	6	None	—	FP	0
10	6	None	—	NC	10
10	6	None	—	None	—
6	4	FP+NC	1	FP+NC	100
6	4	None	—	FP+NC	0
14	12	FP	0	FP	100
6	12	FP	0	NC	17
10	12	NC	1*	FP	22
20	12	NC	1*	NC	100
10	12	FP+NC	0	FP	80
10	12	FP+NC	0	NC	100
10	12	FP+NC	1*	None	—
9	12	None	0	FP	22
14	12	None	0	NC	0

*—Coccidiosis
FP—Fowl pox
NC—Newcastle Disease

Twenty-four of the birds vaccinated with fowl pox virus alone were challenged with fowl pox virus and 16 with Newcastle virus. Twenty birds vaccinated with Newcastle vaccine alone were challenged with fowl pox virus and 30 with Newcastle disease virus. Nineteen unvaccinated controls were challenged with fowl pox virus, and 24 with Newcastle disease virus.

Vaccination with combined fowl pox-Newcastle vaccine or Newcastle vaccine alone gave 100% protection against Newcastle disease. Vaccination with the combined vaccine gave 80-100% protection against fowl pox. Vaccination with fowl pox virus alone gave 100% protection against fowl pox.

One group of six birds was vaccinated with a combined fowl pox-Newcastle disease vaccine and challenged with fowl pox four weeks after vaccination followed by a Newcastle challenge one week later. There was 100% protection against both diseases. All controls challenged with both viruses became infected.

Summary

In a study involving 235 chickens, a mixed Newcastle disease-fowl pox whole embryo vaccine made up in 50% buffered glycerol at pH 7.6 immunized birds against both diseases. There was 100% protection to challenge doses of Newcastle disease virus and 80-90% protection against fowl pox virus following vaccination with the mixed Newcastle-fowl pox vaccines. A two prong wing-web stick was used for all vaccinations.

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Effects of Inhalation of Lindane Vapors upon White Mice

(*Continued from page 99*)

Generations of mice are; F_1, original adults; F_2, offspring of F_1; F_3, offspring of F_2.

The experiment was started on December 19, 1949, and ended 112 days later on April 10, 1950. All mice alive at the end of the experiment were apparently normal and healthy in every respect.

Conclusion

Mice exposed to lindane vapors from a surface treated at the rate of 1 gm. per square foot, under conditions reported in this experiment, showed no acute or chronic effects of the exposure.

Summary

Mice, including both adults and the young born to the adults during the experiments, were kept in cages with surrounding wooden covers treated at intervals of 28 days with lindane at the rate of 1 gm. of gamma isomer per square foot of interior surface. They remained exposed to lindane vapors emanating from the residual deposits for a period of 112 days. The mice showed no ill effects during this period of time.

Effects Of Various Levels Of Lindane In The Feed Of Beef Cattle*†

R. D. RADELEFF,** D.V.M., Kerrville, Texas

THIS work was undertaken in order to study some of the effects, on beef cattle, produced by feeding lindane-contaminated feed. The experiment was designed to observe: (1) the levels and duration of lindane storage in the omental fat of the animals when the chemical was administered in known amounts in the diet, as indicated by analyses of samples of the fat taken from the test animals before, during, and after the lindane-feeding period, (2) toxicological effects of lindane as evidenced by weight gains, efficiency of feed utilization, and general appearance.

Animals and Materials

Eight high-grade Hereford cattle (four heifers and four steers) seven to nine months of age were selected. The animals were divided into four pairs, each containing one steer and one heifer. Each animal was carefully examined to assure that no sick animals were used and each was treated with phenothiazine to remove internal parasites.

The lindane used in the feeding was supplied by the California Spray-Chemical Corporation and the analysis made by Hooker Electro-chemical Company was:

Isomer	Content, percentage
gamma	at least 99.98%
alpha	less than 0.005%
beta	less than 0.005%
delta	less than 0.005%
epsilon	less than 0.005%

Three acetone solutions of this material were prepared on a weight/volume basis to contain 0.454 mg./cc., 4.54 mg./cc., and 45.4 mg./cc. One cubic centimeter of solution was sufficient to contaminate 1 lb. of feed at levels of 1 p.p.m., 10 p.p.m., and 100 p.p.m., respectively. The small amount of acetone evaporated almost immediately.

The grain ration consisted of cottonseed meal (41% protein), 20%; crushed oats, 47%; ground ear corn, 30%; steamed bonemeal, 2%; and salt, 1%. Throughout the experiment, animals were fed good quality pea-green alfalfa hay that had been analyzed and found free of insecticide contamination prior to lindane treatment.

Details of Feeding

One pair of cattle served as controls and the other pairs were used at each level of lindane feeding. Each animal was fed in an individual stall throughout the experiment. All feed was consumed in these stalls. The cattle were allowed exercise during the daylight hours.

Grain and hay were weighed to each animal and the weights were made to the nearest ounce. Each item of feed was contaminated with the appropriate solution of lindane in acetone, the solution being measured with volumetric pipettes. Each day's supply of feed was freshly treated.

The cattle were allowed to eat as much at each feeding as they desired. No attempt at limitation was made. To provide more accurate observations, the cattle were accustomed to the feed before contamination was initiated. Table 1 shows the total feed consumed in the 84-day feeding period, weight gain, percentage of initial weight gained, and efficiency of feed utilization for each animal.

Sampling

To obtain omental fat for analysis, all cattle were operated on one week before contamination of feed began. They were all operated on at the following intervals: two, six, and ten weeks after lindane feeding began and two

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*A report on a study made under the Research and Marketing Act of 1946.

†Tests were conducted at the Kerrville, Tex., laboratory of the Bureau of Entomology and Plant Quarantine. That Bureau participated in planning the experiment and provided personnel to care for the experimental animals. Under a cooperative agreement, the California Spray-Chemical Corporation paid part of the costs and the Hooker Electrochemical Company performed lindane analyses, some of which were checked by Food and Drug Administration analyses of duplicate samples.

Acknowledgment of the very able assistance of Carl Condron, then an employee of the USDA, is made.

**United States Department of Agriculture, Agriculture Research Administration, Bureau of Animal Industry.

weeks after feeding ceased. Additional fat samples were taken from selected animals six, ten, and 14 weeks after the end of the feeding period.

One control failed to provide a sample in the three operations attempted. Anatomical structure of the omentum prevented drawing the organ through an abdominal incision.

The results of analyses of these fat samples, as reported by Doctor Kimball of Hooker Electro-chemical Company, are shown in table 2.

The animals receiving 10 p.p.m. of lindane in the feed showed an average storage level of 8 p.p.m. after 70 days of feeding, which level had dropped to within the limit of analytical accuracy between the sixth and tenth week after feeding of lindane was suspended.

The animals receiving 100 p.p.m. of lindane in the feed showed an average storage level of 98.5 p.p.m. after 70 days of feeding. These cattle returned to a normal level between ten and 14 weeks after the feeding of lindane was stopped.

TABLE 1. WEIGHT GAINED AND FEED CONSUMED DURING AN 84-DAY LINDANE-FEEDING PERIOD

Animal no.	Lindane in feed p.p.m.	Beginning weight lb.	End weight lb.	Net gain lb.	% original wt. gained	Pounds Feed Consumed	
						Total	per 1 lb. gain
1	0	515	655	140	27	1233	8.8
2	0	510	740	230	45	1305	5.6
3	1	500	730	230	46	1330	5.8
4	1	450	650	200	44	1293	6.5
5	10	380	550	170	45	1091	6.4
6	10	465	680	215	46	1354	6.3
7	100	460	655	195	42	1213	6.2
8	100	460	650	190	41	1213	6.4

The values reported in this table represent the analytical readings for the various samples minus a "biopsy blank" determined on the fat of the control steer. The lindane analyses are considered accurate to ± 2 p.p.m.

Toxicological Observations

No observable toxic effects upon these animals became evident. At no time could the various cattle be distinguished as to the level of lindane fed except by the identifying hair brands.

TABLE 2. LINDANE IN OMENTAL FAT OF HEREFORDS FED CONTAMINATED FEED FOR 14 WEEKS

Animal	Lindane in feed p.p.m.	Lindane in Fat: Parts Per Million						
		After Feeding Lindane for			After Lindane Feeding Ceased			
		2 weeks	6 weeks	10 weeks	2 weeks	6 weeks	10 weeks	14 weeks
Heifer	1	no fat	1.0	1.3	1.6	....	0.9	....
Steer	1	0.3	0.8	2.0	0.4	0.5	....	0.6
Heifer	10	3.5	6.9	7.6	2.0	....	0.6	....
Steer	10	no fat	6.7	8.3	4.2	4.9	....	....
Heifer	100	59.0	76.0	86.0	40.0	....	3.7	1.0
Steer	100	70.0	76.0	111.0	60.0	12.0	....	1.3

Results

The analyses on fat from cattle receiving 1 p.p.m. of lindane in the diet returned to normal between two and six weeks after the source was removed, probably closer to two weeks. The figures for this pair of animals must be interpreted carefully, since in only one instance throughout the experiment did the level in an animal reach 2 p.p.m. Since the analytical procedure is accurate to only ± 2 p.p.m., no great significance can be attached to any of the values for this group.

Summary

Lindane as a contaminant of feed at one, ten and 100 parts per million was shown to be absorbed and stored by paired cattle fed such feed, the level of intake in the feed being almost directly reflected in the level produced in the fat of the animals after 70 days of feeding.

(*Continued on page* 119)

EDITORIAL COMMENTS

Milk Containing Antibiotics Creates Problems for the Dairy Industry

When milk from antibiotic-treated quarters is included in the herd supply, a sufficient unitage of these agents is present after processing to create problems in the manufacture of dairy products. Furthermore, such quantities present in the fluid milk supply have been shown to be sensitizing factors. In this respect, failure of the dairyman to withhold milk from treated quarters for at least three days after treatment may have far-reaching effects on consumers of milk; not only in sensitizing them, but by causing the development of resistant strains of organisms that may become pathogens. The benefit that antibiotics might be to large numbers of persons is thereby lost.

Writing on this subject in the current (February) issue of the Michigan Agricultural Experiment Station Quarterly Bulletin, Dean C. S. Bryan, School of Veterinary Medicine, Michigan State College, East Lansing, states that penicillin and other antibiotics that may be used for treatment of mastitis in dairy cows must be kept out of market milk. To do this, every dairyman should be advised to discard the milk from treated quarters, regardless of the physical appearance of the milk, for three days following treatment when crystalline penicillin or penicillin in bougie or ointment form has been used, and up to eight days when procaine penicillin in oil is used for udder infusion.

Results of Study of Market Samples

Milk samples were recently collected at random from several plants to check penicillin levels in the fluid milk being delivered by producers in Michigan. Surprising levels were present in 26 of a group of 27 samples tested; only one of which was suspected of containing the antibiotic. These results point to promiscuous and thoughtless use of penicillin and the lack of witholding milk of treated quarters from the supply. Dairymen must understand that the problems created by this practice are serious, since pasteurization temperatures do not destroy the penicillin.

Specific adverse effects of antibiotic levels on certain dairy products is given by Dean Bryan: The presence of 0.5 units of penicillin per cc. of milk resulted in complete inhibition of acid production by six starter cultures; 0.1 unit per cc. caused marked inhibition and as little as 0.05 units per cc. resulted in moderate but significant inhibition of six starter cultures. As little as 0.0005 mg. of aureomycin per cc. of milk resulted in marked inhibition of acid production, but the presence of 0.00005 mg. had almost no effect on fermentation. As small a quantity as 1% of milk or cream from a treated quarter resulted in a restriction of acid production for from four to six milkings after treatment. Even after reconstitution of milk from powder manufactured from milk containing 1% of milk from recently treated quarters, the growth of lactic acid bacteria was restricted. Inhibition of these organisms seriously affects the production of cottage, cheddar, and other cheeses, buttermilk and butter made from ripened cream.

Since healthful dairy products play a major role in the robust health of American people, particularly children, good sanitary milking and herd management procedures are basic to udder health and the production of high quality milk. Antibiotics are an aid to a mastitis prevention and control program.

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The Bureau of Entomology and Plant Quarantine, with the cooperation of the Bureau of Animal Industry, have announced a new preparation for the control of the screwworm. It is said to be superior to smear 62 in that severely infested wounds need treatment only at three or four day intervals and thereafter at seven day intervals. Only the wound, and a narrow strip one inch or less about it, are to be treated. The new preparation has been designated EQ 335. Its formula is by weight, three parts of lindane, 35 parts of pine oil, 42 parts of white mineral oil, 10 parts of an emulsifier, and 10 parts of silica gel. It is applied with a paint brush. It kills the maggots as rapidly as they are hatched, as well as the adult flies attracted to the wound to lay more eggs.

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A recent addition to the laboratories of nutritionists is the artificial rumen. This apparatus, developed for the purpose of studying physiology of the rumen and the functions of microorganisms, is making possible observations not obtainable by other procedures.

The Question of the Risk of Spreading Disease through Use of Rumen Contents for Rumen Inoculations

The risk of spreading disease would appear to be great when rumen contents from packing house subjects are used for rumen inoculation purposes. Not only must the disease conditions that have been active in the animal from which the rumen contents are obtained be considered, but also the various pathogenic organisms which the animal possibly has had contact with shortly before slaughter. Cattle going through stockyards are exposed to environments likely to have disease organisms present where contamination of their feed and water readily may occur. In as much as cattle also tend to investigate new surroundings and other cattle with their mouths and noses, this would seem to increase the risk of rumen contents from such animals containing pathogenic microorganisms.

A number of diseases come to mind which might possibly be spread to herds through use of rumen contents. Among them may be mentioned oral infections such as actinomycosis, actinobacillosis and infectious types of stomatitis; likewise septicemic infections including pasteurellosis or anthrax; and diseases which are relatively chronic in nature such as Johne's disease and tuberculosis. Parasites such as coccidia or intestinal nematodes might also be transferred to premises in this manner.

While the immediate risk to recipient calves of infecting them with brucellosis might be nil, the risk to older stock with which they have contact might be quite considerable. The same is true when rumen materials are given older animals which are sick. The risk of doing the patient harm may be minimal but the herd, as a whole, should be considered and protected.

While the safest practice is to obtain material for inoculations from animals in the same herd, in the form of cuds or rumen contents obtained with a stomach tube, common sense would demand that care be taken that donor animals are in a healthy condition.—*W. D. Pounden, D.V.M., Pathological Division, Bureau of Animal Industry, Beltsville, Md.*

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We have (in Australia) a strain of *Clostridium chauvoei* which does not affect cattle, but kills many thousands of sheep every year. The same vaccine used for the prevention of blackleg in cattle protects sheep exceedingly well. It is used in flocks to the extent of a quarter million doses annually.—*Hopkirk* in *Vet. Rec.*

Interest in A.S.P. Ads

A recent survey gives most convincing evidence that farm magazine advertisements on What the Veterinary Profession Means to Mankind, sponsored by Associated Serum Producers, is attracting profound reader interest.

An independent research organization, Readex, made a survey among readers of *The Farmer*. In the issue surveyed was Associated Serum Producers' advertisement titled, When a Cow Goes Down. This advertisement won a readership score of 356—the highest total score among both men and women readers of any advertisement in its classification. It also had three times as many readers as the average for its classification.

The new style for these messages on behalf of the profession has brought such excellent results that the same style is to be followed in a new series being released to farm magazines this year. This new series will touch on such subjects as hog cholera, shipping fever, anaplasmosis, and swine erysipelas. All of the advertisements warn of the dangers of these diseases and point out the importance of relying on the veterinarian in coping with them.

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Correlation in Human and Swine Arthritis

That arthritis in man may have its counterpart in swine has been suggested by Dr. L. P. Doyle of the Purdue University Experiment Station, Lafayette, Ind.

Studies on this disease in swine have been in progress for years. The demonstration of relief of symptoms in some cases of arthritis in swine following treatment with ACTH and cortisone parallel reported experience in human clinics. Pointing out these similarities, Doctor Doyle believes that those engaged in the study of arthritis in man could use swine in their experimental work. Up to this time, no suitable laboratory animals have been available. If pigs will serve in tests, some problems in reference to proper drug dose, methods of administration, side actions, etc., can be observed easily and quickly. Hogs can also be slaughtered at any time to observe changes in affected joints or other tissues.

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Estimation as to the stage of disease process in an individual herd at the time eradication of brucellosis is undertaken will dictate necessary effective procedures. — *C. K. Mingle, D.V.M.*

Digestive Juice Therapy*

The liquid portions from the rumen of slaughtered, healthy beeves have assisted as an adjuvant to treatment of cattle and sheep. This material has been used by the speaker for over 18 months for the relief of symptoms of anorexia, bloating, rumen atony, acetonemia, shipping fever, calf diarrhea, and kindred anomalies.

Liquid obtained fresh from the slaughter house has proved most effective. One gallon is given mixed in an equal amount of water via stomach tube to supplement dextrose intravenously for acetonemia. Larger doses, up to five gallons, of fluid rumen contents with 30 gallons of water are given in cases of shipping fever and diarrhea or wherever dehydration is noted in the symptom complex. This may or may not be repeated daily or twice daily and serves only to complement other therapeutic efforts. In some cases of calf diarrhea and inappetence in feeder steers, the rumen fluid therapy alone or with intestinal astringents in the former effected prompt relief of symptoms.

Material is prepared by expressing fluid from the mass of rumen material in a cider press. The resultant liquid is referred to by the speaker as "juice."

If not used immediately, rumen juice may be quick frozen for storage. Such processing kills the protozoa and, according to the speaker, most of the bacteria. Enzymes having value are retained so that after thawing the material is valuable.

A need was expressed for a staple product that has preserved organism and enzyme factors. A showing of a technicolor film depicted field use of this product and bovine patients that demonstrated marked improvement after treatment.

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If newer findings of nutritional research were universally applied, the savings in feed cost and the increase in production of meat would amount to uncalculated millions of dollars and pounds of nutritious food.

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Economy in government expenditures, at all echelons, is pointed out by the Committee for Economic Development as the first line of action to achieve a balance between total demand and total supply.

*Notes from an address by Dr. H. I. Lames, Dysart, Iowa, presented at the Iowa Veterinary Medical Association meeting, January 17-19, 1951.

American Animal Hospital Association

The forthcoming 18th annual meeting of the American Animal Hospital Association (A.A.H.A.) will be held in Atlantic City, N. J., May 2-5, 1951. Chalfonte-Haddon Hall, headquarters hotel, has reserved the luxurious lounge floor and Vernon Room for meeting space.

Pictured above is an air view of the internationally famous Atlantic City Boardwalk.

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Positive skin sensitivity tests in man to histoplasmosis antigen are not considered significant of infection. Varying percentages of the population, ranging up to 85% in some localities, give positive reactions to the skin test. Morphological identification of the disease organism is necessary as confirmatory evidence of infection.

Headlines of the A.V.M.A. Milwaukee Convention

The big question in veterinary medicine today is where—and how extensively—veterinarians will be called upon to serve in military and civilian defense. Recognizing the widespread interest in this subject, A.V.M.A. convention program planners have scheduled a general session that will feature latest defense information supplied by nationally known speakers.

This, along with other new developments of top-ranking interest to the profession, is in store for the expected 2,500 registrants at the 88th annual meeting, to be held at the city auditorium in Milwaukee, Wis., August 20-23, 1951.

Problems of general practice will get major emphasis in the literary sessions. Aim of the program committee is to provide speakers and subjects of maximum interest to the thousand or more general practitioners who will attend.

Visitors to the convention will especially appreciate the comfortable and spacious facilities of the auditorium headquarters, and the excellent set-up for viewing both commercial and educational exhibits. "The Milwaukee auditorium provides by far the best all-around convention facilities we have had in many years," said Dr. J. G. Hardenbergh, A.V.M.A. executive secretary.

Dr. K. G. Nicholson of Milwaukee, general chairman of the Committee on Local Arrangements, said that his committee is mapping a varied program of social events that will keep every veterinarian, woman, and teenager busy all through the meeting. Women's events will be under the general chairmanship of Mrs. E. A. Woelffer of Oconomowoc, Wis.

Wisconsin Avenue, one of Milwaukee's finest thoroughfares. Retail business district in the background.

Nutrition in Small Animals

Speaking before the annual convention of the Ontario (Canada) Veterinary Association on nutrition in small animals, Mr. A. A. Winston, research consultant to the Gaines Division of General Foods, pointed out that dogs nowadays do very well on diets containing as much as 50% carbohydrates. In their wild state, dogs obtained their carbohydrate requirements from the intestinal and organ contents of their prey.

The daily requirement of dogs and cats for calories varies with their breed, size and activity. As a general rule, a ten-pound dog will require 50 calories for every pound of body weight, a 20-pound dog about 40 calories per pound of body weight, a 50-pound dog about 35 calories per pound, a 100-pound dog about 28 calories per pound, and a 150-pound dog about 25 calories per pound of body weight. Growing puppies require about twice as many calories as an adult dog; something in the range of about 70 calories per pound of body weight.

Mr. Winston touched on a phenomenon frequently encountered in practice. Instances are cited in which a dog, obviously receiving adequate amounts of essential nutrients, does not do well. This may occur as a result of abnormalities in the gastrointestinal canal which prevent the digestion of food or its absorption. Tissues may fail to utilize nutrients carried by the blood. Such cases call for diet adjustment to fit the individual patient as prescribed by a veterinarian and not the standard prepared dog foods which are designed for the normally functioning animal.

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In the Catalogue of Birds of the Americas, 4,227 species and 8,896 subspecies are listed as known to occur in North America, Central America, the West Indies and other adjacent islands. The "catalog" is a monumental work of 15 volumes and 6,372 pages. It required 39 years to write it. The first volume was published in 1918, the 15th in 1949. The Chicago Natural History Museum (formerly Field Museum) is the publisher.

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From the results of a record annual total of blood tests for brucellosis in cattle in 1950 (6,000,000 tests), infection rate is shown as 3.5%; the lowest incidence since 1942. Herd rate of infection has been reduced from 16% in 1949 to 13% in 1950.

Edward K. Glover, 1882-1951

Dr. Edward K. Glover, 68, died at the local hospital in Wellington, Kans., of a paralytic stroke on January 23, 1951.

After graduation from the Kansas City Veterinary College in 1912, Doctor Glover served as president of the Royal Serum Company until 1918 when the company was dissolved. At that time he formed the Royal Biological Laboratories in Kansas City, which he operated for several years. In 1921, Doctor Glover joined with Mr. Cliff Haver to form the Haver-Glover Laboratories, which well known supply house in Kansas City still bears his name, merging the Royal Biological Laboratories in the new organization. He sold his interest in the Haver-Glover organization in 1925 and established a small animal practice, and in 1927 reentered the biological manufacturing business.

Doctor Glover suffered a head injury six years ago and has been incapacitated since the mishap.

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Throughout a 66-day trial during the summer of 1950, the effect on gains in Hereford steers of artificial shade and an automatic shower was observed. In these tests it was shown that, (1) livestock shades can be improved by raising the roof height to 10 to 14 feet; (2) shade on grassland was superior to that located on bare ground in haylots; and (3) covering the roof with hay added to the desirability of shades.

Eight steers having shade and an automatic shower gained appreciably more than a similar lot under identical management except that no shower was provided.

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Bovine tympanites is related to mineral deficiencies in the soil. It has been possible to reduce the incidence of bloat in cattle fed alfalfa hay or grazed on alfalfa pastures in the region of Weston, Ontario, Canada, by either of two methods of supplying disodiumphosphate. Top dressing fields at the rate of 125 lb. per acre or the addition of 10 lbs. of disodiumphosphate to each 100 lb. of a standard mineral mixture, fed free choice, has limited the number of cases of acute tympany.—*H. M. LeGard, D.V.M.*

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Some exposed pipe line coating, joint filler in concrete floors, and caulking on silos have been shown to be poisonous for hogs and cattle.

Obituary

Jerry Raymond Beach, CORN '13, 62, Professor of Veterinary Science, University of California, died at Davis, January 4, 1951. He was probably the first well qualified scientist to devote full time to research on diseases of poultry. In 1914, soon after he joined the staff of the Division of Veterinary Science at California, his specialized work began to yield results of scientific merit and great practical value to the poultry industry of the Pacific Coast. His earliest work was done on the roup-complex of chickens and he demonstrated that one form of roup was caused by a nutritional deficiency, now known as A avitaminosis, which could be prevented by the addition of

Dr. J. R. Beach

greens to the ration. Another major activity was his study of avian coccidiosis which led to the use of milk products as a means of controlling this disease. These two discoveries and their immediate application in the field brought about a speedy and remarkable improvement in poultry health and efficiency in California.

Some other achievements include inauguration of nicotine treatment for roundworms; improvements in vaccination for fowl pox; and methods for the differential diagnosis of several virus diseases of chickens. Doctor Beach pioneered in the discovery of pneumoencephalitis; in fact, his major effort in the past decade was devoted toward the study of the virus, diagnosis of the disease, and methods for its prevention and control. He was the first anywhere to prepare a fairly successful vaccine for the prevention of the disease.

His frequent and up-to-date articles and bulletins have been a definite contribution to the welfare of the poultry industry. His voluminous bulletin on diseases of poultry was kept current by numerous revisions over a period of 30 years and the demand for copies by poultrymen throughout the world was heavy. During his long years of service, he was vitally interested in training poultry pathologists and a long list of men were influenced by his teachings, which has led to a better understanding of poultry disease problems.

Born in West Danby, N. Y., December 21, 1888, he graduated from Phillips Academy, Andover, Mass., in 1910 and received his degree in veterinary medicine from Cornell in 1913. He served on the staff at the New York school as assistant in veterinary diagnosis in 1913-1914. Since then he has been with the University of California.

Many honors have been conferred upon him. He was guest worker at the Rockefeller Institute, 1929-31; veterinarian to the Ministry of Agriculture of the United Nations Relief and Rehabilitation Administration in China, 1946; delegate to the World's Poultry Congress at The Hague, 1921; Leipzig, 1936; Cleveland, Ohio, 1939; and Copenhagen, 1948; and to the International Veterinary Congress in London, 1949. He served as vice-president of the World Poultry Science Association in 1922. Of the large number of veterinarians stationed in China during the war and since, Doctor Beach is one of only a few who have published the account of their experiences (see VETERINARY MEDICINE, 42:261 [July], 1947).

Doctor Beach was a member of the American Veterinary Medical Association, Poultry Science Association, U. S. Livestock Sanitary Association, California Veterinary Medical Association, World's Poultry Association, and was an associate in the Society of Bacteriology.

Surviving are his wife, Elzaida, two daughters, Mrs. George E. Smith, Portland, Ore., and Ruth of San Francisco, and a son, George, of College Station, Tex. Doctor Beach's mother, Mrs. Alice Beach, resides in Oakland.

By unanimous decision, Doctor Beach's coworkers in the School of Veterinary Medicine elected to establish a memorial to him in the form of a library encompassing poultry diseases and related subjects.

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In answer to the question, "How do I get started in poultry practice?," Dr. J. O. Alberts recommends that you "just begin." The practicing veterinarian need only apply his training and experience in disease control and prevention to serve well his clients engaged in poultry or egg production.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

Brucellosis Control in Brazil

In the state of Sao Paulo, Brazil, it has been decided that under present economic conditions the eradication of bovine brucellosis by the test and slaughter method is not practical. Such plan would necessitate the killing of too many of the best animals in the dairy herds without at the same time giving the clean animals other than nominal sanitary protection. Therefore, vaccination of adult non-reacting cows and calves with strain 19 will be practiced. In order to distinguish between naturally infected animals and those having a vaccination agglutination reaction, dependence will be placed either on the findings of Traum, *et al.*, or Dick, *et. al.* Details of their plans as given in vol. VIII, no. 4, of *Boletim Da Sociedade Paulista de Medicina Veterinaria* are as follows:

"A. In herds of range cattle, owing to the large number of animals, preliminary agglutination tests are performed only in the sera from cows which have aborted. When the tests confirm the presence of brucellosis in the herd, all the animals are vaccinated with Brucella 19, irrespective of their age or previous infection.

"We have used this method with excellent results since 1942 in infected herds totaling about 80,000 animals. The results were checked in 49 herds with a total of 6,219 animals. We observed about 90% overall reduction in the number of abortions, with a consequent increase in live births and milk production. In bacteriological tests of milk and placenta from some of the vaccinated animals Brucella 19 could not be found.

"B. In dairy herds producing grade A milk the following procedures are adopted:

1. Two agglutination tests are performed at a 30-day interval on the sera of all the animals over one year of age.

2. Every animal with an agglutination titer over 1:25 is permanently withdrawn from the milking line.

3. The heifers and cows with two negative agglutination tests are carefully identified and vaccinated with Brucella 19.

4. All calves between six months and one year of age are identified and vaccinated with Brucella 19; the herd being periodically visited for this purpose.

5. Agglutination tests are performed in the sera of the vaccinated cows every three months, in order to keep records of the normal agglutinin titers induced by vaccination.

6. Wherever a sharp rise in agglutinin titer, a persistently high titer, or abortion occur, complete bacteriological examinations are performed of the milk, colostrum, or uterine discharges. The cows with proved infection are discarded.

7. In order to be incorporated in the dairy herd, a new cow must either have a certificate of vaccination as issued in the performance of items three and four, or have two negative agglutination tests made at 30-day intervals, in which case the cow is vaccinated at once with Brucella 19.

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In regard to so-called biological warfare (BW) the consensus seems to be, at least in the light of our present knowledge, that rinderpest, foot-and-mouth disease, contagious pleuropneumonia, hog cholera, fowl plague, and pneumoencephalitis, all practically strictly animal ailments, are to be guarded against by veterinarians. The diseases common to man and animals that also come under the vigilant attention of veterinarians are glanders, anthrax and brucellosis. Likewise tularemia, psittacosis and bubonic plague, which have animal reservoirs, must not be overlooked. Another highly virulent glanders-like disease, melioidosis of rodents, occurs in India, Malay States, and Indo-China. Fortunately it is a rare ailment, though fatal for man.

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Alloxan, an oxidized product of uric acid (it has also been obtained from the mucus of the intestines in diarrhea) when injected into dogs, destroys the islet cells of the pancreas so that, because of the resulting hyperglycemia, diabetes develops.

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The name "porcupette" has been suggested by Dr. Albert R. Shadle of the University of Buffalo for the small porcupine still in the nursing stage.

VETERINARY PARASITOLOGY

A. O. FOSTER, B.A., M.A., Sc.D.
Beltsville, Maryland

Meeting of Parasitologists at Cleveland

Many papers of veterinary interest were given at the 25th annual meeting of the American Society of Parasitologists, December 27-29, 1950. Only a few can be noted here, but abstracts of all the reports are available in the *Journal of Parasitology*, 36(6) Section 2.

a. An outbreak of parasitic gastroenteritis in feeder lambs, with heavy death losses, was described by B. Schwartz, Chief of the Zoological Division, BAI. Incidentally, Doctor Schwartz was elected president of the Society.

b. Mayhew, of Louisiana State University, reported that as little as 0.3 gm. of phenothiazine daily has a definite influence on eggs produced by nodular worms in calves. Daily doses of 0.5 gm. for 14 days resulted first in production of abnormal eggs, then in cessation of egg output.

c. Schiller and Rausch, of the Arctic Health Research Center at Anchorage, Alaska, incriminated the arctic fox and tundra vole as reservoirs of echinococcosis on St. Lawrence Island. Dogs were not found infected and reindeer are not killed for food. The parasite was found, however, in five of seven foxes (*Alopex lagopus*) and 14 of 587 voles (*Microtus oeconomus inuitus*). Human infection is apparently common. Since there is no significant association between the foxes and man, the latter is presumed to acquire the infection from contaminated green plants that are eaten raw.

d. In experimental infections of Jersey calves, Vegors and Porter, of the U. S. Animal Disease Research Laboratory at Auburn, demonstrated that *Strongyloides papillosus* is a dangerous parasite in very young calves. Clinical illness was produced in 12 animals, seven of which died. The symptoms were diarrhea, inappetence, poor condition, and retarded growth. The chief lesion noted at autopsy was catarrhal inflammation of the intestine with petechiae and ecchymoses. Weight gains of heavily infected calves were 33 to 79% less than those of controls.

e. Levine, University of Illinois, reported that many iodine compounds inhibit the development of horse strongyle larvae when they are applied to the manure in comparatively low concentrations.

f. Durbin, of the U. S. Bureau of Animal Industry, directed attention to the proved occurrence of *Protostrongylus rufescens*, a nematode lungworm in sheep, in three widely separated areas in the United States (New York, Wyoming, Virginia) and emphasized that the parasite is probably quite generally distributed throughout the country.

g. Moore and Brown, at the New York State Veterinary College, found that an all-mash ration containing 0.0104% nitrofurazone, when fed for 14 days, gave complete protection against mortality losses from coccidiosis in experimental trials with an undetermined species of Eimeria in turkey poults. In the two control groups, 22 of 30 poults died with coccidiosis. The treated birds, however, experienced some morbidity, and passed oocysts. In limited toxicity tests with normal poults, single doses of 75 mg./kg. appeared to exceed the maximum tolerated dose although 50 mg./kg. were tolerated by two test birds.

h. Because chickens develop a maximum resistance to the roundworm, *Ascaridia galli*, at about the age of sexual maturity, Ackert and his co-workers, at Kansas State College, tested the "immunizing" effect of the female sex hormone, diethylstilbestrol, on young pullets. Although the injected birds harbored at autopsy an average of 11.3 worms compared with 15.5 in the controls, the data were interpreted as showing that the hormone injections enhanced the resistance to the nematodes. The findings suggest many experimental problems, both academic and practical, but are of special interest because of the support they give to a view often but ineffectually challenged by enthusiasts of acquired immunity, namely, that young animals *per se* are frequently, if not commonly, more susceptible than older ones to certain parasites and diseases. It will be recalled, moreover, that in earlier studies workers at the same laboratory had shown that other factors associated with growth and maturity, *e.g.*, more goblet cells in the intestinal mucosa and higher hemoglobin levels, are also influential in increasing "age resistance."

PUBLIC HEALTH

JAMES H. STEELE, D.V.M., M.P.H.
Atlanta, Georgia

Bovine Tuberculosis

The prevalence of bovine tuberculosis in the United States has continued to decline, except during World War II. The BAI reports that the rate of reactors found in 9,000,000 cattle during fiscal year ending June 3, 1950 was 0.19%. This is favorable for the nation but on closer scrutiny and inquiry, a great variation in reactor rate is found. Many of the western states have rates which approach zero. A recent report of one of the large cities of the nation for 1949 states that 1,591 reactors were found in a test of 162,460 animals, a rate of almost 1% (0.979%). Many veterinary directors of the midwest and eastern states are concerned with the status of their respective states. Fortunately, no human cases of bovine tuberculosis are being found but that should not rule out the potential source of human infection since few such cases are typed.

The Scandinavian and Scotch investigators have reported that pulmonary bovine tuberculosis is not uncommon and that the disease can be airborne around contaminated premises where infected cattle are kept. The veterinary practitioner is the first line of defense against this important public health problem. He is an adviser to his clients and, in many cases, a consultant to the local board of health on diseases of the dairy herd. In recommending testing of milk producing animals annually or biannually, depending on past prevalence of the disease, he is protecting the farmer and his family against disease and economic loss, in addition to assuring a safe, wholesome milk for the urban consumer.

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The recent report of rabies in the mongoose in Puerto Rico raises the question, Why was this animal transplanted to the West Indies?

The mongoose was imported into the West Indies between 1870 and 1885 to reduce the rat population which was alleged to have destroyed one-fourth of the sugar cane crop in Jamaica. Within a decade after the mongoose was introduced, it had reduced some species of rats slightly, while other species abounded. In the meantime, this predatory animal was rapidly becoming known as a pest which destroyed ground nesting birds, lizards, toads and poultry. In Martinique and St. Lucia, the mongoose reduced the fer-de-lance snake to the point where it is very rare. To sum it up, the mongoose has not efficiently controlled the agricultural pests in any part of the West Indies, or other parts of the world. Now that it has become a wild animal reservoir for rabies, a difficult problem is presented in reducing their numbers and eradicating rabies in the areas where the mongoose is a reservoir of the disease. Sometimes the cure is more serious than the problem.

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The Third Inter-American Brucellosis Congress met in Washington, D. C., November 6-10, 1950. Two hundred delegates and observers from 22 countries discussed the economic and health problems due to this disease. It was emphasized at the Congress that since there is no effective cure for the disease in man, the control is dependent on its eradication in animals. In the meantime, it is essential that all milk products be pasteurized. Following the Congress, the WHO/FAO convened their Consultant Group on Brucellosis. It was composed of 26 members and six observers from 11 countries. Their report stressed the need for accurate methods of diagnosis in man and effective control methods. This report is available from Dr. Martin M. Kaplan, WHO, Geneva, Switzerland, or the International Documents Service, Columbia University, New York, N. Y.

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A Basic Radiological Health Training Course will be given at the Environmental Health Center, 1014 Broadway, Cincinnati 2, Ohio. This course is open for professional people who are concerned with the effects of radiation as a health hazard. The course includes discussion of the basic theory of radiation, radiation detection instruments, the detrimental effects of radiations on man, the means of shielding and protection against radiation, and maximum permissible radiation dosage. The course has attracted public health and sanitary engineers, physicians, sanitarians, veterinarians, and other public health scientists. A veterinary officer will join the faculty in June of this year. He will specialize in radiation problems of animals and foods of animal origin.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

There were a number of papers related to the field of poultry diseases given at the annual meetings of the American Societies of Parasitologists and Protozoologists held in Cleveland during the week of December 25. When one attends such meetings, he is impressed with the volume of information that is being made available by research workers in all the fields of biological sciences, and how little a single individual can absorb. The following is an attempt to give the highlights of a few of the papers given at these meetings. Abstracts are available from the respective associations.

Two papers on *Ascaridia galli* presented by Dr. J. E. Ackert and his associates, of Kansas State College, Manhattan, were related to the effect of nutrition and hormones of the fowl to parasitisms. Injection of the female hormone, diethylstilbestrol, was found to increase the resistance of young female chickens to the nematode. These results suggest a reason for the greater resistance of mature chickens to *A. galli* found by previous research. Diets deficient in both calcium and phosphorus reduced the size of the worms and lowered their total numbers in the intestine. These results are attributed to the worm requirements for these minerals. Manganese appeared to have no effect on parasitism, and this is attributed to the fact that the mineral is lacking in the ascarid body.

A total of five papers on coccidiosis in avian species were presented at the two meetings. Three of these by Dr. C. A. Herrick and his associates, at the University of Wisconsin, were related to the metabolism of the host and its effect on the parasite. Chickens infected with *Eimeria tenella* have been shown by the Wisconsin group to exhibit certain physiological manifestations such as high blood sugar level, low muscle glycogen, impaired coordination and muscle asthenia. Their research work is suggestive that carbohydrate metabolism is affected by infection with this parasite. When infected chickens were exposed to decreased environmental temperatures, *E. tenella* infected birds showed decreased metabolic rates as contrasted to increased rates in the normal controls. Infection with this coccidium caused a decrease in the respiratory rate of the cecal mucosa. On recovery the rate returned to normal.

Dr. P. A. Hawkins of Michigan State College, East Lansing, reviewed his exhaustive studies on the species of coccidia in turkeys. He has identified two species not previously described in turkeys. These are *Eimeria dispersa*, originally described from the Bob White quail, and pheasant; and *E. gallopavorus*, a newly described species found so far only in turkeys. From experimental studies and field reports it appears that *E. meleagrimitis* is the only species capable of producing serious losses in turkey flocks. This species and *E. meleagridis* were formerly thought to be the only ones found in turkeys.

Drs. N. D. Levine and H. C. Hanson, of the University of Illinois, reported on a fecal survey of wild birds collected during the summer of 1949 from the Perry Region of the Hudson Bay. They found coccidia in two species of geese and one species each of cock ptarmigans, ducks and ruddy turnstone. No coccidia were found in 33 birds of 16 other species.

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It is the time of year for the annual campaign to save your clients both grief and money by urging them to purchase their annual supply of baby chicks and turkey poults from pullorum disease-free flocks. There are now enough hatcheries in the country which operate under the U.S. Poultry Improvement Plans with classifications of U.S. Pullorum-Passed and U.S. Pullorum-Clean grades so that there is no excuse for prospective buyers to purchase either chicks or poults of lower than these grades. As has been stated many times in the past, the purchasers of U. S. Pullorum-Tested and U.S. Pullorum-Controlled stock can be reasonably assured that they are buying infected stock. Lists of sources of U.S. Pullorum-Passed and U.S. Pullorum-Clean flocks can be secured from the official agency in your state.

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Off-flavored eggs may result from a number of causes. Undesirable flavors and odors can result from feeding rape, turnips, onions or excessive amounts of fish oil.

CLINICAL REPORTS

Femoral Intramedullary Pinning in an Aged Pointer

CLAYTON STEPHENS, D.V.M., Tupelo, Mississippi

The idea that only specialists in small animal practice are sufficiently qualified to perform creditable surgery on dogs is not sound. As evidence that the general practitioner can, by application of his talents and thoughtful surgical technic, effect successful repair in fracture reduction, the case of an aged Pointer is cited.

A male Pointer, over nine years of age, was presented for examination, at which time a diagnosis of a transverse fracture of the distal third of the right femur was made. Open reduction and intramedullary pinning were immediately performed. The pin technic included insertion of a stainless steel fracture pin into the medulla of the proximal portion; forcing it upward and out through the trochanteric fossa. Fractured fragments were grasped and the pin directed into the medullary canal of the distal fragment and fixed in the spongy bone at the epiphysis.

No supplementary splintage was considered necessary and uneventful recovery occurred. Radiograph indicated good union. The pin was removed 14 days after surgery. Photograph was taken during the healing process. The pin, scarcely visible, is in place extending approximately one inch above the skin over the hip.

Editor's Note

Veterinary practitioners are encouraged to broaden their practices to cover small animals on the farms where they attend livestock and pets of townspeople. Such case reports as the foregoing, and numerous others, illustrate the possibility of interesting practice that will not only bring financial returns proportionate to effort, but the veterinarian will be rendering a service and meeting the responsibilities of his profession in his practice area. The surgical technic outlined above is not new, and is routine in many hospitals. The intricacies of operative procedures can be successfully concluded with the limited facilities ordinarily available to the veterinarian in rural communities.

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Accident with Strain 19

CHARLES W. DOWNING, D.V.M., Lyons, Kansas

This case report is presented for the purpose of creating a respect for the potentialities of one of our commonly used biologics, *Brucella abortus,* strain 19 vaccine.

On an afternoon in late summer of 1949 a farmer brought in three Angus heifers by truck for vaccination with strain 19. The animals were between the ages of four and eight months, one weighing about 450, and the other two about 350 pounds. No facilities were available for unloading the animals so vaccination was performed in the truck. The owner manually restrained each of the two smaller heifers and they were vaccinated subcutaneously in the region of the neck. The third animal jumped just as the loaded syringe was approaching. The farmer was pushed off balance and reached quickly for the side of the stock rack on the truck to brace himself. The action all took place very suddenly, as such things do, and he accidentally struck the loaded syringe with his wrist, the needle point just breaking the skin. Examination of the syringe showed that to all gross appearances the full 6 cc. dose remained so that the accident seemed to have brought no actual injection of material into the man's wrist.

Immediate first aid treatment was administered which, to the client, seemed ridiculous for such a minor wound. Treatment consisted of thorough cleansing of the area, using soap and water with a soft brush, and applying a coal tar proprietary preparation as a disinfectant. Reasons for so doing were explained to the man and it was recommended that his local physician be contacted as to advisability of further prophylaxis. Upon the physician's recommendation, the client went to the office where the very innocent looking wound was cauterized with 10% silver nitrate, and a bandage applied. A blood sample was taken at

this initial visit and sent to a laboratory for examination of the normal Brucella agglutination titer carried by the individual. Report received a few days later showed it to be negative in all dilutions.

The owner of the animals took them home and felt no adverse effects until 9 o'clock that night when he began feeling uncomfortable, as though coming down with a cold. His sleep was restless and at 3 a.m. he experienced a chill. He ate no breakfast the following morning, had a severe headache and alternated with chills and sweating. He was admitted to the hospital that afternoon, carrying a temperature of 101.6 F. Under his physician's care, he was immediately placed upon oral doses of 250 mg. of aureomycin every three hours. One hundred thousand units of penicillin were given and repeated several times to combat any secondary infection which may have accompanied the wrist injury.

During the subsequent, very uncomfortable, days, the patient experienced severe headaches and backaches with chills and sweating continuing, but gradually subsiding. Oral medication had such a nauseating effect upon him that he cared little for eating and consequently lost considerable weight. His temperature varied from 99.0 to 101.8 F. On the fourth hospital day his temperature was down to a normal of 98.6 F. and varied slightly above and below that for the next several days. The aureomycin was continued for a total of ten days at which time he carried a normal temperature, was feeling much improved and was discharged from the hospital. Due to the antibiotic's use causing some nausea to the patient, the physician changed to the use of chloromycetin as soon as it was obtainable. Self dosage with chloromycetin was continued at home for a period of ten days. Route of administration and rate of dosage was the same as that employed with aureomycin.

While hospitalized, the man complained of some aching and soreness of the wrist at the point of initial injury. Local treatment of ice packs was used to good effect. About 2½ weeks following discharge from the hospital he again reported discomfort from the wrist and requested an *x*-ray be made. This was done, the findings being negative. Ice packs were again used to alleviate the condition and after that time no further complaint was made of the wrist.

Laboratory findings on the case during its progression are interesting. The initial agglutination titer report was negative while a test made on the third hospital day showed complete agglutination in dilutions of 1:640. A second retest about three weeks after the accident showed the titer unchanged, and a third retest at 3½ months showed the same results. A blood count made on the day of injury showed a normal WBC of 7,350 and RBC of 4,100,000. On the fourth hospital day the WBC count was down to 3,850 but no change in RBC. These gradually rose as shown by subsequent checks and on the last visit at 3½ months the counts were normal at WBC 8,300 and RBC 4,870,000. From a normal weight of 150 pounds, the patient dropped to 135 pounds but regained his normal weight in slightly less than a month's time. At the last physical examination, patient appeared completely and permanently recovered as he had experienced no relapses and claimed to be feeling in excellent health.

It is hoped that this report may prove of value to those who have not made it a practice to exercise caution in the handling of strain 19. The above circumstances would lead to the conclusion that an active case of human brucellosis was produced by the accidental introduction of strain 19 organisms into a normal individual.

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Ethylene Glycol (Prestone) Poisoning in a Dog

DAVID JACOBSON, D.V.M., Woodward, Oklahoma

A seven-year-old German Shepherd bitch that had drunk about a pint of a mixture of prestone and water the night before was brought into my clinic.

According to the owner, she had shown no sign of illness for about one hour, and then proceeded to vomit copiously and often. This had led him to believe that she might rid herself of the antifreeze. However, her condition worsened and the dog was presented for examination at 7 a.m., the following day.

The animal appeared intoxicated. She staggered on movement. There also appeared to be severe impairment of vision. She vomited approximately 250 cc. of yellowish fluid. In less than 30 minutes after her arrival, she was unable to rise and when an intravenous injection of glucose was attempted, it was found that the veins had collapsed, although the animal was still partially conscious.

One hour later she became unconscious and gave all the appearances of being under deep anesthesia. Breathing was deep and regular; heart strong and all reflexes abolished. There

was no response to metrazol, coramine or caffeine sodiumbenzoate in restoring consciousness.

This anesthetic state prevailed without change until 8 p.m. when the dog was stricken with a series of strychnine-like convulsions that persisted for over 45 minutes. These convulsions were more of a continuous tonic-clonic type than the powerful tonus manifested by strychnine, but at first glance could have been mistaken for the latter. This convulsive state merged perceptibly into a constant air-hunger gasping. This symptom, similar to that seen in heart failure, lasted for over an hour; although it appeared that death could not be more than seconds away. In the writer's experience such air hunger had never been known previously to last more than five minutes before death occurred, and the hour long persistence of life despite the gasping was very unusual. The dog died about 10:15 p.m.

Discussion

Ethylene glycol ($HOCH_2CH_2OH$) is a colorless, viscid, hydroscopic liquid of sweet taste. It has been used in the manufacture of some pharmaceutical products intended only for external use. Its widest use is as a permanent type antifreeze for automobile radiators. It is known to be markedly toxic. Rust inhibiting agents included may also be toxic.

The above case is noteworthy in that the writer has never found any reference to ethylene glycol poisoning in veterinary literature. The latest Merck Manual (8th ed.) makes no mention of such poisoning. On a prestone container is given warning that drinking the fluid may be fatal, but neither an antidote nor advice to call a physician is given.

Postmortem examination revealed a flaccid stomach filled with dirty brownish fluid. Gastric mucosa showed many tiny black spots about 2 mm. in diameter. The lungs were dull grey-green, spotted throughout with very bright scarlet areas. The heart was relaxed. Neither kidneys nor liver displayed any lesions.

Summary and Conclusions

Ethylene glycol is a deadly poison which may be voluntarily ingested by dogs. Symptoms and lesions can readily be confused with other types of poisoning (barbiturate or strychnine) and as far as the writer could determine, treatment is futile.

It is not too unlikely that this case report may explain hitherto unknown causes of death. The writer would be pleased to learn of the experiences of others with poisoning by this chemical.

Doctor Schnelle, Chief of Staff, Angell Memorial Hospital

Officials of the Massachusetts Society for the Prevention of Cruelty to Animals have announced the appointment of Dr. Gerry B. Schnelle, UP'26, as Chief of Staff of the Society's Angell Memorial Animal Hospital, to succeed Dr. Erwin F. Schroeder, who has been retired from active responsibility. Doctor Schroeder will remain on the staff in an advisory capacity.

Dr. Gerry B. Schnelle

Doctor Schnelle has been associated with this institution continuously since his graduation, except for a period of military service when he was assigned as officer in charge of veterinary activities at the War Dog Reception and Training Center, Front Royal, Va. He is author of Radiology in Small Animal Practice and many articles that have appeared in periodic veterinary journals.

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Effects of Various Levels of Lindane in the Feed of Beef Cattle

(*Continued from page* 106)

The stored lindane was shown to be metabolized or otherwise eliminated at a rapid rate; the rate being roughly proportional to the quantity stored.

Lindane, at the indicated level in the diet for 84 days, caused no significant interference with the health, weight gain, or efficiency of utilization of feed of the cattle in this experiment.

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Epidural anesthesia will not anesthetize the cow's udder.

ABSTRACTS OF LITERATURE

Acetonemia in Cows

In summarizing 152 cases of acetonemia[13] treated at the Veterinary College of Vienna, Austria, since 1930, the authors make the following comments: (1) Intravenous administration of 10 to 20 oz. of dextrose in aqueous solution (no concentration given) twice daily for five to seven days proved the most effective treatment. (2) During the first injection from 200 to 400 units of insulin should also be given. (3) Epinephrine hydrochloride given simultaneously appears to support the glucose therapy. (4) A calcium preparation may be supplied to overcome accompanying acidosis. (5) If tetany or paresis is noted, 500 cc. of 20% solution of calcium gluconate is administered intravenously. (6) To those animals in which nervous symptoms are present chloral hydrate is given *per os* in 1 oz. to 0.5 oz. doses, repeated for several days. (7) Vitamin B_1 is of no value in the treatment of acetonemia. —*G. L.*

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Postpartum Heat in Sows

An experiment to clarify the questions concerning the occurrence of a postpartum heat in sows is reported by Warnick, *et al.*[14] The object of the study was to obtain information on which there is a conflict of opinions among hog growers. These include the incidence of postpartum heat, potential fertility, condition of the genital organs during the postpartum interval, and the influence of suckling upon the occurrence of estrus and ovulation.

Thirty-six sows were checked for a postpartum heat and later killed to determine ovarian activity. Eighteen of these animals (50%) came in heat and were bred. Only two, of this group of sows, that had lost their pigs either at birth or immediately afterward, ovulated. None of the remaining 18 animals that failed to come in heat had ovulated when killed ten days postpartum. It is suggested that an extra ovarian source of estrogen is responsible for the postpartum anovulatory heat. Further observations indicated suckling not to be a factor in inhibiting ovulation.

Nutritional Requirements of Rumen Microorganisms

The nutritive requirements of organisms present in the rumen of healthy animals must be fulfilled if they are to digest coarse roughage. That these nutrients are present in good quality roughage and inadequate in poor quality feeds has been shown by Burroughs, *et al.*,[15] in experiments using the artificial rumen.

The authors theorize that the types of nutrients fall into three general classifications: (1) That type relating to energy which presumably is the motivating force for rumen bacteria to attack or digest such compounds as cellulose. (2) A second type needed, such as nitrogen-bearing compounds or nitrogen, which is eventually synthesized into protein material. (3) A type which appears to be inorganic in nature and which is believed to be an integral constituent in enzymes or enzyme systems, as well as vitamins synthesized by rumen organisms.

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Yeast for Young Animals

Changes in the normal intestinal flora of baby pigs, calves and pups that may result from infection by *Bacillus aerogenes* or some other organisms may cause non-contagious, and often fatal, disease. Intoxication and/or septicemia due to a number of common bacterial forms are cited as examples.

Alteration in the bacterial flora of the intestines in young animals frequently follows ration changes. To overcome damage attributed to coliform organisms and the associated disease symptoms, it is recommended that 3 oz. to 1 pt. of live beer yeast be fed daily for a few days. According to findings made at the Animal Hygienic Institute of the University of Munich,[16] the treatment has been of considerable value. A yeast clysis may be desirable to initiate the feeding schedule outlined. — *R. Seiden.*

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Enteritis, as seen by the practitioner on Corn Belt hog farms, has as its chief cause, faulty nutrition.

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HAVE YOU TRIED Norden DINOL?

For "shy-breeding" or non-settling cows

An estrogenic solution

Each cc. of Dinol contains 5.0 mg. dienestrol (3.4-Bis-[parahydroxyphenyl] 2.4 hexadiene) in N. F. ampul oil base.

Dinol is effective for the treatment of functional sterility of cows that come in heat, but fail to settle with frequent service because of insufficient estrogen production by their ovaries during estrus.

Dinol (dienestrol solution) aids in supplementing ovarian estrogen output during estrus in non-settling or "shy-breeding" cows.

Dienestrol supplements ovarian estrogen production during estrus, thus providing the necessary stimulation of the maturing follicle to proceed toward ovulation and corpus luteum formation.

For problem breeders with no pathological or anatomical abnormality present, administer 1 cc. Dinol subcutaneously as soon as the cow has come in heat and breed 12 to 24 hours later. Large animals may require a 2 cc. dose.

In cases of long standing infertility, the treatment should be repeated at successive heat periods if conception does not occur following first treated service.

Dinol is supplied in 10 cc. vials (5 mg. per cc.) $3.00

Order from Your Norden Ft. Worth Branch

NORDEN LABORATORIES

"The Mark of Quality"

LINCOLN NEBRASKA

VETERINARY ITEMS OF INTEREST

Gonadectomy in a cockerel results in a capon; in a pullet in a poularde.

▼

In their attempts to show kindness to dogs, misguided legislators often achieve only cruelty to human beings.

▼

There is reported definite breed tolerance in swine to simultaneous immunization against hog cholera.

▼

The incidence of rabies in Iowa has increased from 241 cases in 1949 to 374 reported during 1950.

▼

Artificial insemination practices among dairy cattle have served to bring the problems of bovine infertility to the front.—*H. B. Wessel, D.V.M.*

▼

Skim milk (powdered or fluid) or whey is reported to prevent symptoms of parasitism in calves and swine.

▼

Heritability of economic factor has been studied by Knopp and Clark at the U. S. Range Livestock Experiment Station, Miles City, Mont. These investigators have shown that ability to gain weight in the feed lot is inherited. The influence of heredity is reported to be 72%, or higher than were measures of quality and conformation.

▼

Three cases of vesicular stomatitis human infection have been reported by Hanson and coworkers of the University of Wisconsin. The blood serum of all three showed a high level of neutralizing antibodies for vesicular stomatitis virus. Another animal disease is added to the list of those which are communicable to man.

▼

In his summary of the forage research conducted at Beltsville, Md., Dr. O. E. Reed, chief of the Bureau of Dairy Industry, pointed out that preserving the hay crop as wilted grass silage or barn-dried hay saved more of the dry matter, protein, and carotene of the standing crop than was saved by field curing, under most favorable hay-making conditions.

A shiftless livestock farmer or dairyman is a poor client.

▼

A value of $150,000,000. is claimed for the poultry industry of Illinois.

▼

No case of reported barrenness in cows or mares should be treated without a routine manual examination for pregnancy.

▼

An Associated Press release carrying a date line of January 24, 1951, announced a foot-and-mouth disease outbreak on three premises in northern England.

▼

Chronic fowl cholera in a farm flock is not amenable to treatment. The best advice to give is disposal of all birds, disinfection of premises and to restock with healthy chicks.

▼

Improperly constructed stanchions and floor, poor quality bedding, careless and improper handling of milking machines, and other poor management practices are predisposing factors to mastitis in dairy cows.

▼

I have never encountered a case of enterotoxemia in sheep which was associated with starvation or with movement to a poor pasture; a fact which I think contradicts any herbage deficiency theory as to the cause of the ailment.—*Allen* in *Vet. Rec.*

▼

Healthy replacement stock forms the primary line of defense in any disease prevention program. Day-old chicks or poults or the use of hatching eggs from pullorum-free stock is one of the requirements in such a program.

▼

During the 1950 pullorum testing season, the University of Massachusetts tested 475 flocks comprising 1,360,865 birds. This is in contrast to 1920 when 108 flocks with 24,718 birds were tested. The success of the Pullorum Disease Eradication Program in Massachusetts is indicated by the fact that 98.82% of all birds tested in 1950 were in non-reacting flocks. This is in contrast to 9.77% that were in non-reacting flocks, in 1920. (Van Roekel, *Featheredfax*, Nov. 30, 1950.)